RAILROAD GAZETTE

FRIDAY, MARCH 29, 1895.

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Solid Bridge Floors in Chicago.

We showed last week the designs of solid bridge floors adopted for the track elevation in Chicago, but omitted to give credit for these designs to the engineers who are responsible for them. As is well known, Mr. L. H. Clarke is the engineer in charge of the track elevation. Mr. Albert Lucius, of New York, made these plans after being advised by Mr. Clarke that he would prefer an I-beam floor to a corrugated floor. The reasons were partly of policy, aside from engineering considerations, and partly engineering preference. The chief engineers of the Rock Island and of the Lake Shore also approved of the choice of this form of floor. From Mr. Lucius' sketches Mr. Clarke and Mr. Handy, Chief Engineer of the Lake Shore, selected the design which forms the basis of the set of details which we published.

Contributions.

Large or Small Grates.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I notice in the account of the *Proceedings* of the Western Railway Club, at the January meeting, given in your columns Feb. 1, 1895, page 66, that there is quite a difference of opinion about the relative values of small and large grates and fire-boxes. Since reading the discussion I have looked up what has been written in standard works about the matter and I find but little that is definite, and not much argument about the theories of those who advocate the two sizes of fire-boxes. I beg to suggest that you give to your readers a condensed statement of the theories for and against the large fire-box and such information as seems pertinent about the effect of smoke preventers on the efficiency. COAL MINE.

[We will try to do some of this on the editorial pages. —EDITOR.]

Night Signals.

MARCH 23, 1895.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Again I am glad to note an advance toward the successful conclusion to the search for a desirable night semaphore as evidenced by the letter of Prof. C. Herschel Koyl contained in your last issue. Let Mr. Koyl beware, however, of the ignis fatuus which is leading him after a night position color signal. It is a form signal that we want and not a color signal.

More than all, let him seek for a means of distinguishing between a home and distant signal at night by form and not by color. He will then have a perfectly consistent signal and need not be troubled, because his red is not vermilion. If what I suggest cannot be done by so ingenious a person, I am content to remain mistaken.

LUKE FORWARD.

A Richmond Compound on the C., C., C. & St. L.

We have received from Mr. Garstang, Superintendent of Motive Power of the Cleveland, Cincinnati, Chicago & St. Louis Railway, a report of the comparative performance of 12 simple engines, and one compound, from Jan. 1 to Oct. 1, 1894. The results are conveniently summed up in the tables herewith. These engines were all built by the Richmond Locomotive Works, the compound having been put in service early in 1893. These 13 engines are of the same class in every particular except that one of them, No. 472, is compounded; they are operated on the same division and under the same conditions, and it will be observed that the report given covers nine months.

PERFORMANCE OF 12 SIMPLE RICHMOND ENGINES AND COMPOUND RICHMOND ENGINE NO. 472.
Nine Months, Jan. 1 to Oct. 1, 1894.

Engine No	Engine mileage.	Freight Car mileage.	Cost of repairs.	Cost repairs per 100 miles run.	Tons of coal consumed.	Miles run 1 ton coal	Average per train.	Lbs. of coal per engine mile.	Lbs. of coal per car mile.
428	20,987	514 781	$1,266 63	$6.04	1,249	16.80	24.5	119.0	4.8
432	20,766	493,427	1,503.44	7 42	1,130	17.93	24.3	111.5	4.6
434	25,690	597,846	1,168 35	4.55	1,556	16 51	24.1	121.7	5.2
463	26,854	615,367	733.12	2.73	1,494	17.97	24.3	111.3	4.8
464	27 560	645,190	1,430.28	5.19	1,5 9	17.91	24.3	111.6	4.8
465	25,065	524,283	928.79	3.71	1,493	17.35	24.2	119.1	4.7
467	26,071	600,766	1,167.51	4.48	1,436	18.15	24.8	110.1	4.7
469	24,433	603,044	799.48	3.27	1,392	17.55	24.6	113.9	4.6
472	18,978	468,150	740 51	3.90	862	22.02	24.7	90.8	3.7
473	21,294	455,874	771.43	3.62	1,215	17 53	24.7	114.1	4.2
474	24,234	578,940	504.72	2.08	1,286	18.84	24.2	105.1	4.4
475	18,570	401,709	613.24	3.30	981	18.93	23 0	105.6	4.6
476	18,903	445,676	551.03	2.91	1,026	18.42	24.0	108.5	4.6
Total	298,905	6,945,056	$12,178.53	$4.07	16,659	17.94	24.3	111.5	4.8

RECAPITULATION.

	Av. engine mileage.	Av. freight car mileage.	Av. cost repairs.	Av. cost per 100 miles.	Av. tons coal consumed.	Miles run to 1 ton coal.	Av. cars per train.	Lbs. coal per engine mile.	Lbs. coal per car mile.
Simple engine	23,327	539,742	$1,014 88	$4 09	1,316	17.72	24.3	112.8	4 8
Comp'd "	18,978	468,150	740 51	3.90	862	22.02	24.7	90.8	3.7
Favor of compound engine				4. 65%		24.27%	1.65%	19.50%	22.92%

It would seem, therefore, as if the comparison must be a valuable one.

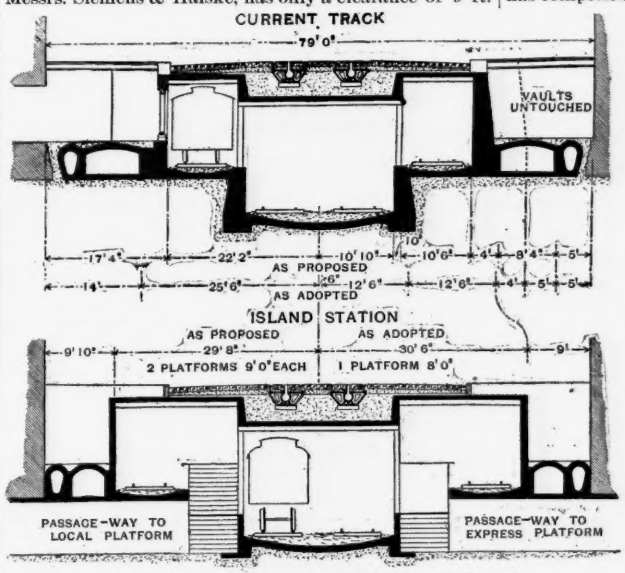
The principal dimensions of these engines are:

Type	10-wheel.
Steam pressure	180 lbs.
Cylinders, simple	19 × 24
Cylinders, compound	19 × 24 and 30 × 24
Diameter of drivers	56 in.
Diameter of boiler	60 "
Heating surface, flues	1,739 sq. ft.
Firebox	151.27
Total	1,890.27
Number of flues	241
Length of flues	13 ft. 10 1/16 in.
Diameter of flues	2 in.
Firebox	8 ft. 11 13/16 in. × 3 ft. 5 7/8 in.
Flue area	3 94 sq. ft.
Grate area	31.3 "
Total weight with 3 gages	133,600 lbs.
Weight on driving wheels	103,700 "

A Suggestion for New York Rapid Transit.

BY MR. FR. VON EMPERGER, C. E.

In reply to the recent letter from the Rapid Transit Commission to the people of New York City in general, and especially as a protest against the statement "they have widened the tunnel from 44 ft. to 50 ft. This has been done in the interest of safety upon the advice of all engineers," which means a track 12½ ft. wide, I have addressed a letter to the above commissioners which gives the following facts: That the Manhattan Elevated road has for instance several miles of road 11 ft. apart (against the above named 12½ ft.), and that this is the case where the greatest traffic is handled with perfect safety. More than that, the underground railroad recently built in Budapest, Hungary, by Messrs. Siemens & Halske, has only a clearance of 9 ft.



Von Emperger's Plan for a Rapid Transit Tunnel.

Note.—The car on the way track is the city transit car, 8 ft. 8 in. wide; that on express track is a Pullman

with just the same size of car as our elevated road (7 ft. 10 in. without cross seats, 8 ft. 8 in. with cross seats).

The Commission has apparently been guided by the idea that the greater the clearance the better accommodation the public will receive. The public only want good-sized cars and the same in regard to stations. It does not care if the car in the tunnel has 6 in. or 2 ft. clearance, provided there is sufficient ventilation, which can be had without question in the case of four tracks communicating, but if this 2 ft. clearance means that the stations will be 1½ ft. narrower, then the public has the right to object against such an "improvement."

It may be inserted for comparison that the "City & South London Railway" and the "Glasgow District Subway" have single tubes 80 sq. ft., while the board propose four times 160 sq. ft.

In Boston, where the street used for a subway is wide enough to allow the subway stations to be made three times as large as on our elevated roads, they can, of course, afford to allow the track a clearance of 12 ft., too, but in this city this means a reduction of the island platform from 9 ft. to 7½ ft., which leaves for each side, after deduction for railing, less than 3 ft., which is entirely inadequate, especially for a tunnel station.

To improve this condition I propose *First:* To build a tunnel, with a track of 10½ ft. clearance, track 11 ft. apart including columns, which is enough even for a Pullman car 9 ft. 10 in. wide, and gives 11 in. clear to a common car 8 ft. 8 in. wide. *Second:* To place tracks on a different level. *Third:* To specify 16 ft. in the clear as the smallest size of an "island platform."

This would allow a platform of 9 ft. In the clear, which is sufficient for a single station. In island platforms serving for two tracks this width alone is even not enough, but my plans for each track show that a separate platform can be used, one above the other, connected by a stairway, thus giving the whole station a width of 18 ft.

The step-like arrangement of the track is further adopted, as a reference to the plans will prove: (1), to reduce the quantity of excavation; (2), to bring the local track nearer to the street; (3), to allow a shorter stairway to the express track below it, and (4), because it is desirable to make the excavations nearest to the buildings as shallow as possible, and place the deeper excavation in the centre of the street.

Besides that, this unnecessary increase of clearance has some other far-reaching and undesirable consequences:

1. It destroys the private vaults entirely for any other use than as a pipe gallery, for which purpose alone they are too large, and it is a waste to use them as such.

2. It increases the costs of construction considerably and has compelled the Board to shorten the route already.

3. It brings the tunnel and the adjoining buildings dangerously near to each other, which latter would then have more to suffer from the noise of the working.

On the other hand, if the Board would return to the old width of 44 ft., or 11 ft. for each track, with 10½ ft. clearance:

1. The same size of cars could be used.

2. The stations could be larger.

3. Vaults could remain untouched by placing pipe galleries below them between the tunnel and the sewer.

4. Costs of construction would be smaller.

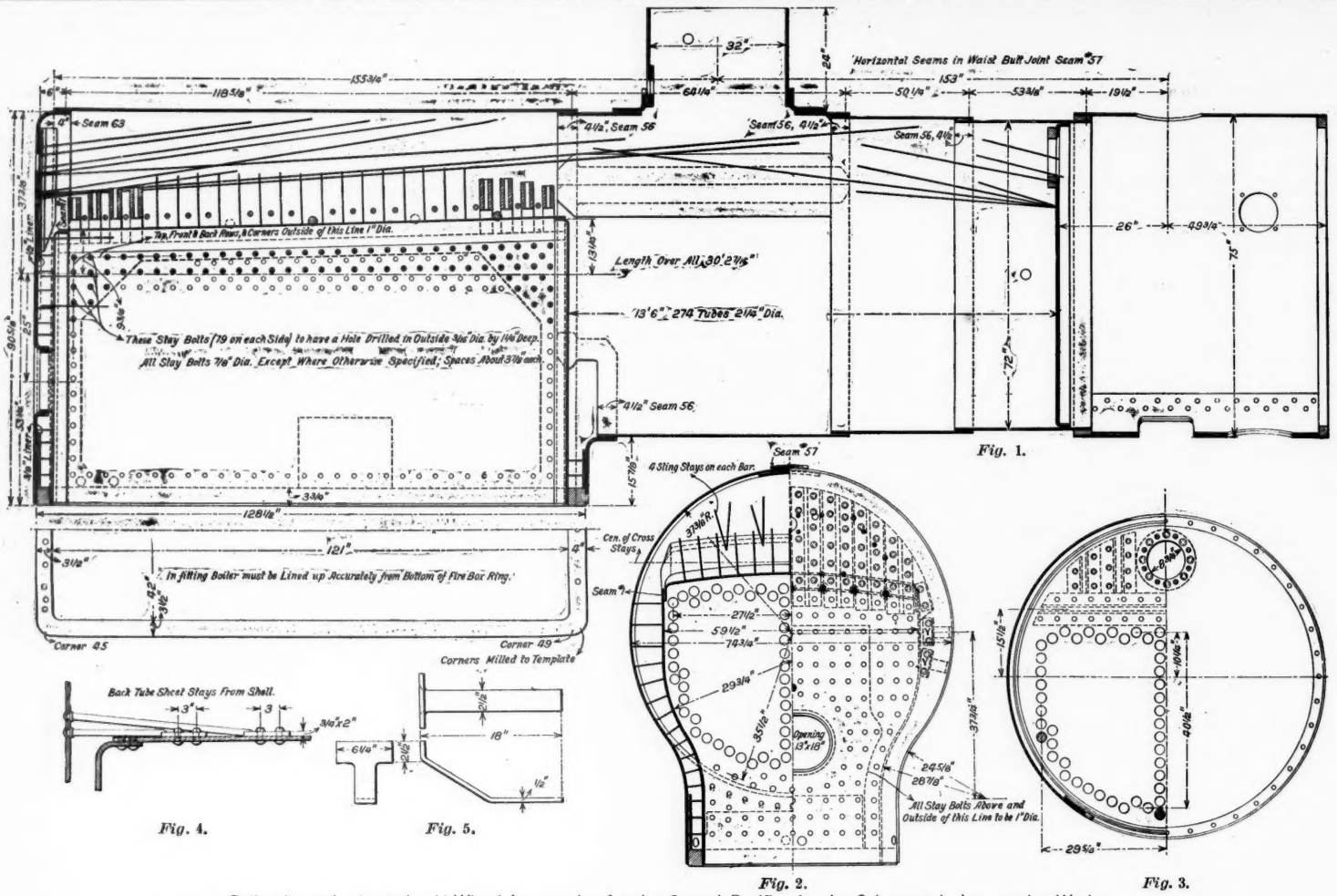
5. Further, by renting those reconstructed vaults an income could be derived to cover part of the expense. To get at a scale of what value these vaults represent we must remember that from City Hall to Fifty-ninth street there is more than 500,000 sq. ft. of vaults, and it would not be necessary to charge more than $3.50 per square foot per annum or 3 cents a month to pay the 4 per cent. interest of the whole indebtedness in curred by the city for the subway ($50,000,000 at 4 per cent., $2,000,000). This is of course too high, but it will serve to show us the value which we propose to throw away thoughtlessly.

6. Adjoining buildings would be safer during construction and the tunnel would not be endangered if new buildings were erected.

7. In future the crowded sidewalks of Broadway will have to be relieved by a covered sidewalk to be constructed in these vaults, and which can be continuous from the Battery to 59th street. So that I consider it absolutely necessary to repeal this "improvement."

All these things are in shape to be final now, and so it is high time to bring this necessary change before the public in general and to the knowledge of engineers especially, because the adopted plans do not permit the construction of an express station between 14th street and City Hall, now or in the future.

[This communication from Mr. von Emperger was in hand for publication last week, but was unavoidably held over. Since that time a certain change in the situation has taken place. The Rapid Transit Commission,


Horizontal Seams in Waist Butt Joint Seam 57
Seam 63
Seam 56, 4½"
Length Over All 30' 2⅞"
13'6" 274 Tubes 2¼" Dia.
These Stay Bolts [19 on each Side] to have a Hole Drilled in Outside ⅜" Dia. by ⅛" Deep.
All Stay Bolts ⅞" Dia. Except Where Otherwise Specified; Spaces About 3⅛" each.
Seam 57
4 Sling Stays on each Bar.
Cen. of Cross Stays
Opening 13"x16"
All Stay Bolts Above and Outside of this Line to be 1" Dia.
In fitting Boiler must be Lined up Accurately from Bottom of Fire Box Ring.
Corner 45
Corner 49
Corners Milled to Template
Back Tube Sheet Stays From Shell.
Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.

Boiler for 22-in. by 24-in. 12 Wheel Locomotive for the Central Pacific—by the Schenectady Locomotive Works.

ers have made public what are termed the final plans, and have said that the inner tracks may be depressed below the level of the two outer by a depth of not more than 10 ft. Mr. von Emperger is inclined to think that this was consequent upon his suggestion, as above, which was filed with the Board March 12, and believes the Board will comply with further suggestions if it takes time properly to consider them. He objects to the use of the word "final," believing that the subject is of such great magnitude that it should receive much more study than has been given to it. He thinks that to submit complete plans to the criticism of the public would in the end save time and money and secure better work and better accommodation.]

Cost of Power at Niagara Falls and Buffalo.

The Niagara Falls Power Co. has made three propositions to the city of Buffalo, regarding the delivery to that city of 10,000 H. P., either undeveloped or developed, upon the company's land at Niagara Falls. Owing to the uncertainties and losses involved in the question of transmission, the company cannot name a price for electrical power transmitted to the city.

They will furnish 10,000 H. P., undeveloped, on the lands of the company at Niagara, at $10 per horse power per year, the city of Buffalo to make its own wheel pits and side tunnels, and put in its own wheels; or 10,000 H. P. developed on the shaft of turbines furnished by the company at $13 per horse power per year; or 10,000 H. P., electrical alternating current, at a voltage of 2,080 as it comes from the company's generators, at $18 per horse power per year. In each case a 24-hour power is meant. To develop this power it will be necessary to extend the present wheel pit at least 140 ft. and three 5,000 H. P. turbines, together with three 5,000 H. P. dynamos, must be installed. This work can be done within eight months. The power company has found that it cannot economically deliver, or transmit, to Buffalo less than 10,000 H. P. and will not consider the transmission of less amount.

Referring to the statement said to have been prepared by Mr. Richard Hammond showing the cost of 1,000 H. P., 10 hours per day to be $21 per horse power per year, the company is prepared to prove that for the city of Buffalo, and under the conditions assumed in that statement, the actual cost of such 10-hour power is not less than $82 per horse power per year. A recent test of the cost of steam power, ranging over a period of 18 months, in a large Buffalo plant using more than 1,000 H. P., shows the actual cost of 11-hour power to be $32.70. At the Buffalo City Water Works, where 3,600 H. P. is used, the average cost is $77.55. It is estimated that at these works the cost of 3,000 H. P. during 1895 will be over $60. This is pump horse power, and the average efficiency of the engines having been found to be 80 per cent., the average cost of steam horse power during the last two years has been $62.04. In Milwaukee, Wis., figures from very economical steam plants are as high as $75.83 for pump horse power and $68.25 for steam power. This does not include insurance and taxes. Mr. Huntley, the General Manager of the General Electric Co., of Buffalo, estimates that in nearly every factory in that city the cost of steam power is little, if any, less than from $45 to $60.

Seventy-two Inch Crown Bar Boiler—Schenectady Locomotive Works.

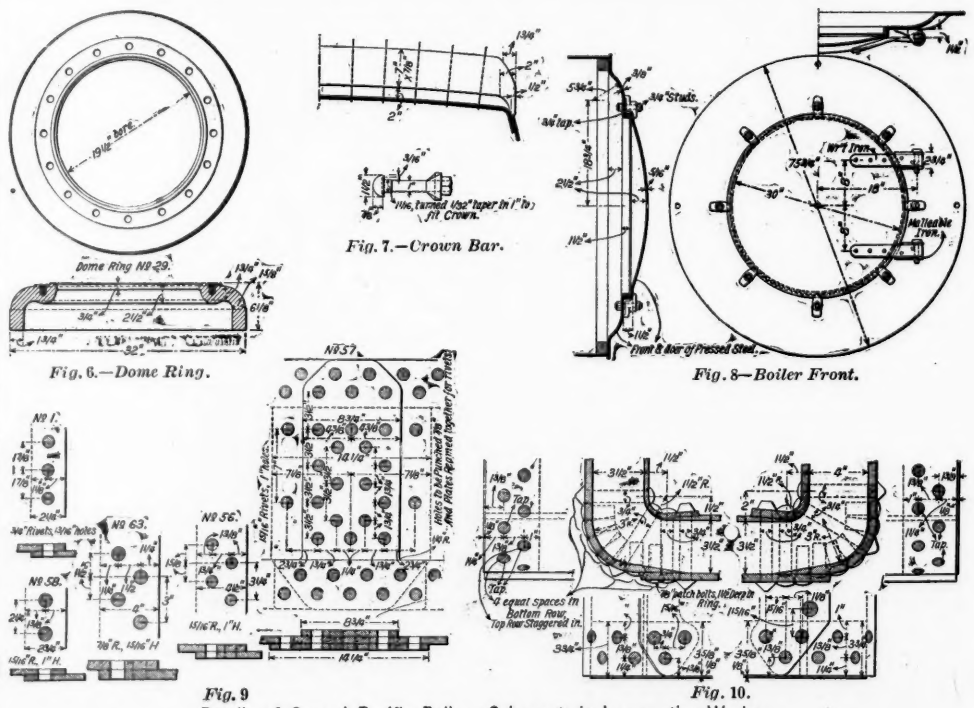
Locomotive boiler shells 6 ft. in diameter are not common, enough of them have not been built to make the designs commonplace, nor has the time come when a study of the construction of such large boilers will fail to teach something new, even to the most advanced designer of locomotives. A boiler of this sort is shown by the illustrations; it is one of a lot built for the Central Pacific Railroad by the Schenectady Locomotive Works for a lot of 22+26-in. 12-wheelers.

The boiler has a 6 ft. shell and 274 2¼ in. tubes, 13 ft. 6 in. long. The crown sheet has a crown bar support, and there are some specialties in the construction that are worth attention. The thicknesses of the sheets are; in barrel, $\frac{11}{16}$ in; sides and top over firebox, ⅝ in.; back head, ⅝ in.; throat, ⅞ in.; dome and front tube sheet, $\frac{9}{16}$ in.; dome connection, ⅜ in.; covering strips of horizontal seams, ½ in. The firebox sheets are, crown, ⅜ in.; sides and back, $\frac{5}{16}$; tube sheet, $\frac{9}{16}$.

Fig. 1 shows the boiler in longitudinal section and gives the principal dimensions. Figs. 2 and 3 show the back and front ends and give the location of the tubes and the head bracing. The bracing for the back tube sheet is of a good form and is intended to reduce the cracking and to make secure that part of the back tube sheet that is not stayed by the tubes at the bottom. It is shown in Fig. 4. Fig. 5 shows the bracing of the back head outside of the staybolts at the sides.

The top, front and back rows of staybolts outside of the broken line, on the side elevation, Fig. 1, are 1 in. in diameter and are drilled on the outside with a tell-tale hole $\frac{3}{16}$ in. in diameter and 1¼ in. deep. The other stay bolts are ⅞ of an in. in diameter. The dome is put on, as it should be, with a separate base that can be annealed after flanging; this is one of the most important improvements in locomotive boiler construction that has been made in recent years. The crown bars at the front and back of the firebox have been made lower than the intermediate bars.

Fig. 6 shows the dome ring. Fig. 7 shows the crown bar in detail and the crown bar bolt, and Fig. 8 the



Details of Central Pacific Boiler—Schenectady Locomotive Works.

pressed steel boiler front. Figs. 9 and 10 are perhaps the most interesting of the details, as they show the joints that are used on 6 ft. boilers of the locomotive type that are intended to carry 180 lbs. steam pressure under the severe conditions of locomotive service. The firebox ring corner designs, shown in Fig. 10, will be

interesting to boilermakers, as they indicate how carefully the work must be laid out and fitted up to prevent leakage in locomotive firebox rings. The corners of these rings are milled to a template.

Improvements of the Harbor at Seattle.

In a report to the Board of Tide Land Appraisers, of Seattle, Wash., made by Mr. Virgil G. Bogue, many valuable suggestions are made concerning the reclaiming of the tide water flats at the mouth of the Duwamish River and the building of new and suitable docks, railroad terminal facilities and the laying out of avenues and

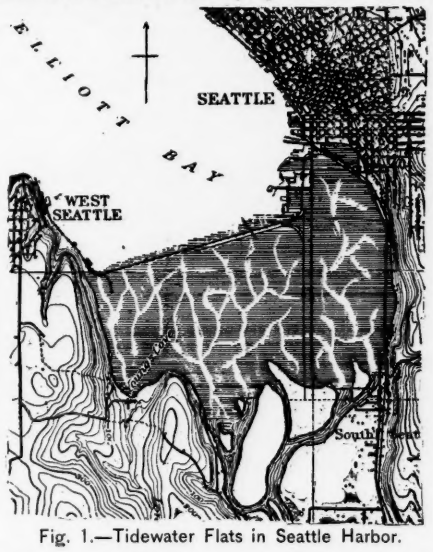


Fig. 1.—Tidewater Flats in Seattle Harbor.

streets upon the reclaimed land. We show in Fig. 1 a map of the flats at the mouth of the Duwamish River as they at present exist and which it is proposed to fill in and reclaim. At present a trestle extends across them to West Seattle, giving railroad communication to that place from Seattle. The tide lands are the property of the state and state boards have been appointed to consider plans for reclaiming them. Plans for building a sea wall near the present route of the trestle above mentioned, for filling in the flats and for the proposed waterways and canal, have been approved by the War Department and a company has been organized to carry them out. These are shown in Fig. 2.

The railroad terminals proposed are as yet wholly tentative and the Board, to which plans have been submitted, has no authority to do anything more than appraise and plat the proposed improvements.

The growth of the city has been such that considerable portions of the tide lands have been encroached upon, and are now covered by buildings, wharves, etc. These cannot be greatly disturbed, and in the proposed plans have to a certain extent determined the lines of streets, etc.

The conditions at Seattle are about as follows: Elliott Bay, the harbor at Seattle has ready access to the Pacific Ocean through deep channels by way of Puget Sound and the Straights of Fuca. The harbor is well sheltered from storms by various headlands and ranges of hills. It is safe and commodious, and with proper wharf facilities can accommodate a very large trade. The ordinary tide is about 14 ft.

The southern boundary of the harbor is determined by the rim of the tide flats which extend across the southern portion of the bay at the mouth of the Duwamish River from Seattle to West Seattle, a distance of two miles. These flats have been formed by materials brought down by the Duwamish River through its feeders from the Cascade range. Their area, not including any portion north of Madison Street; nor any portion of the harbor strip or channels, is about 2,000 acres. They are partially traversed by two or three shallow crooked channels, and by the channel of the Duwamish River. Their surface is exposed at low tide, and is from 6 to 12 ft. below water at high tide.

The northern rim of the flats slopes rapidly into deep water, reaching a depth beyond which it is not practicable to build piers and wharves. The flats are formed of materials which can be easily and cheaply dredged at small cost, and the materials thus removed can be used in filling in adjacent portions of the flats.

The water front, measured from Smith's Cove south to the tide flats and thence along the rim of the flats to West Seattle, has a length of six miles. It is 300 ft. wide as far as the foot of B street, a distance of 3.6 miles. From here to a point one mile west of the city's boundary, a distance of 1.4 miles, the harbor strip is 600 ft. wide. Two waterways are projected, as shown in the engraving, to extend south into the main body of the flats. Each waterway is to be 1,000 ft. wide between its outer limits, while the channel proper, measured between pier head lines, will have a width of 500 ft. This is shown by dotted lines in the map. The east waterway is to be one mile in length and the west waterway 0.8 of a mile in length. Their lines will be due north and south, and they are 2,800 ft. apart. Each is to be connected with the mouth of the Duwamish River, according to lines approved by the War Department and shown upon the engraving. The total length of water front along the lines thus laid out is 8.4 miles.

The outer line of the 300-ft. harbor strip is quite generally in water of a depth from 35 to 70 ft. at low tide. This line, therefore, has no special meaning as a pier head line, owing to the expense of building stable wharves in water of this depth. The outer harbor line of the 600-ft. harbor strip also drops into deep water for some distance in two places, but its location, on the whole, is more satisfactory for wharf building than that of the 300-ft. strip.

The topography of the surrounding country and the configuration of the land upon which Seattle is built are such that all railroad lines passing through the city or reaching a point opposite its commercial center must use all or a portion of the street called Railroad avenue lying north of Jackson street. This avenue was laid out in 1887. Its width is 120 ft. from Smith's Cove south to the extension of Addition street into the flats, and from here south its width is 200 ft. Below Washington street its present course is due south across the main body of the flats. It is not built on originally solid ground at any point. Its object was to provide right of way through the city for all steam railroads that might require it, either at that time or in the future. The railroads which now enter the city are the Northern Pacific, the Great Northern, the Columbia & Puget Sound, and the Seattle, Lake Shore & Eastern. The franchises of these different railroads occupy all of the avenue except an 80 ft. strip along and adjoining its eastern side, which is devoted to sidewalk purposes, and a 22-ft. strip along the western side. The Northern Pacific Company, and the Seattle, Lake Shore & Eastern have joint freight houses, sidings, etc., on the 600-ft. harbor strip near Weller street, and a joint passenger station on the south side of Columbia street at its junction with West street. The Great Northern has its freight and passenger station on the west side of Railroad avenue, near Columbia street. The Nofthern Pacific, the Columbia & Puget Sound and the Seattle, Lake Shore & Eastern have joint repair shops between Third and Fourth streets, just south of King street.

None of the street crossings at Railroad avenue are closed, and as there is only a 22-ft. strip along its west side, the avenue itself is used as a street for the purpose of obtaining communication between wharves, warehouses, etc. This, with frequently passing trains, switching, etc., makes a very undesirable condition of affairs. To remedy this it has been proposed, first, that the water front should be so arranged that there should be free scope for future development; second, that a tract of land on the tide flats suitable for a local freight terminal for all railroads, and another tract suitable for a union passenger station, should be selected. These proposed stations are shown in the engraving. Further, it is proposed that railroad avenues should be laid out, from which tracks could reach most of the wharves now existing or that may be built; third, that the tide land should be platted in blocks suitable for large plants, but of such size that they could readily be divided into ordinary city lots should this become desirable.

No change has been made in the alignment of the existing Railroad avenue north of Norman street, except a movement to the east for a short distance. As the avenue is now located it cuts the property between the points last named into very narrow strips of land of little value. The change will leave lots of 100 ft. or more in depth between the avenue and the innner harbor line, having water frontage on one side and the avenue on the other.

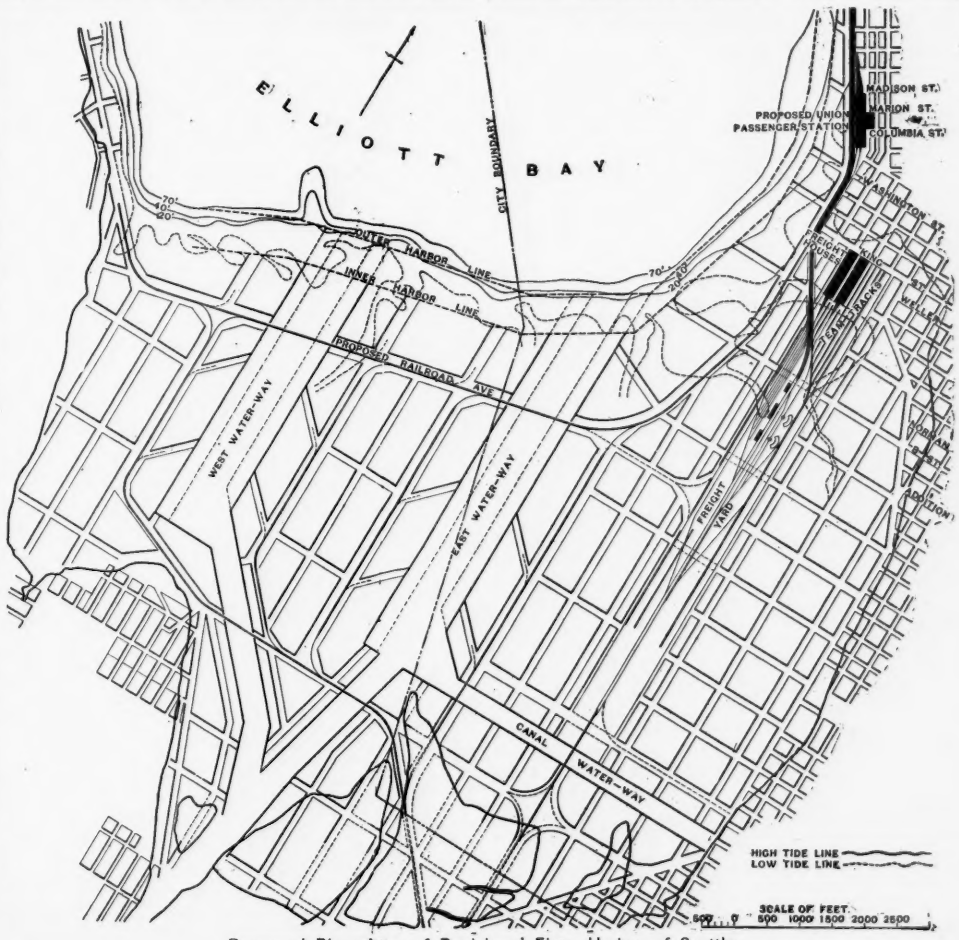
In the plat, as proposed, there is a curve in Railroad avenue to the west, at Norman street, to a point from whence a tangent is laid parallel to that portion of the 300-ft. harbor strip lying opposite. From here it continues on a tangent for 1,300 ft., where a curve to the west begins, terminating near the east side of the east waterway. From here it crosses the flats on a tangent, to a point 1,200 ft. south of the elevator at West Seattle. This fixes the street 900 ft. south of the inner harbor line on one side. On the West Seattle side it meets the harbor line as shown.

The plat, as arranged, gives room for long slips and wharves, basins with short wharves or bulkhead landings, ship-building plants, dry docks, warehouses, etc. The considerations which have determined the location of the main railroad avenue have determined in a general way the location of similar 250-ft. streets parallel to and 550 ft. back from the waterways. The tracts of land thus formed between these streets and the waterways will be valuable for warehouses, manufactories, etc.

The several widths of Railroad avenue, as proposed, are: From the east waterway to a point near the elevator, beyond West Seattle, 250 ft.; from the east waterway to B street, 200 ft. The lengths, widths and other features of the drawbridges, which must be built for crossing the channels or waterways, are matters which will be settled by existing circumstances. From B street to Mercer street the width of the proposed avenue is 180 ft. For crossing Railroad avenue at various points overhead bridges are proposed.

The sea wall is to be built along the rim of the flats outside of and close to Railroad avenue. Its location is not as yet definitely determined. It will be substantially like the one at San Francisco. The earth, sand and other materials between the bulkhead and pier-head lines will all be dredged out to a suitable depth and deposited inside the sea wall. On the areas dredged out wharves will be built.

For the Union passenger station a tract of land 250 × 126 ft., enclosed by Columbia, Marion, West and Post streets, is suggested. The train house, etc., will be located on land adjoining the passenger station. A tract of land, containing 148 acres, shown on the map, is to be reserved for a freight terminal station.



Proposed Disposition of Reclaimed Flats, Harbor of Seattle.

Automatic Air-Brakes Without Angle Cocks.

For more than a year the Michigan Central has been running a passenger train, consisting of three cars and an engine, without valves of any kind in any part of the main air pipe, hose or couplings. The reason for this, as will be understood by all familiar with air-brake practice, is to avoid the liability to danger due to the possibility that in connecting together the brake pipes of the cars and engine of a train, the inspector may by oversight leave an angle cock closed, thus putting out of control of the engineman all of the brakes in the train back of the cock thus left closed. The success with which this train has been operated leads the officers of the Michigan Central to believe that the same plan

could be employed without inconvenience on longer trains. Mr. J. A. Chubb, Superintendent of Air Brakes, gives us the following notes of his experience:

"The three cars and engine are entirely without angle cocks or valves of any kind in any part of the main air pipe, hose or couplings. We have substituted in the place of these a simple blind coupling similar to the ordinary hose coupling, but with a solid finished face that makes an air-tight joint when coupled to an air-brake hose. This blind coupling is made of malleable iron and is galvanized to prevent rusting.

"When this train is made up all hose are coupled together in the usual manner except that on the forward end of the engine, and the one on the rear of the last car. These two are coupled to the blind couplings, which closes the air passage at both ends of the train line the same as if angle cocks were used. Both ends of all the cars and of the engine are equipped with blind couplings, making it possible to shut off the air at any point that it may be found necessary. This train has been in daily service (except Sundays) since Jan. 1, 1894, and is still running. Our experiment has been so successful, that I think passenger trains can be successfully operated without angle cocks or valves in any part of the main train line.

"When changing engines or when separating the train for any purpose, the train line is emptied of all air, the brakes, of course, being set. This has been mentioned as an objection, the claim being made that there would be delay in releasing the brakes after the engine was re-attached to the train, especially should the train be a long one. Our experiments show that this is not the case, and we believe that engines can be changed, and cars picked up or set out, in less time, if this device were used, than with angle cocks, provided, that with the latter all precautions were taken in the way of testing brakes, to prove that the angle cocks were all open and the brakes operative throughout the entire train.

"As the engine reservoir, charged to 90 lbs. pressure, will re-charge an empty train line of 16 cars to 55 lbs. pressure, 5 lbs. greater than that in the auxiliary reservoirs of the cars, when the brakes have been set by a service application, it will readily be seen that no delay should occur to an ordinary train through failure to promptly release the brakes that would be set in changing engines, or from other causes. Even if this were not true, the engine reservoir is for a certain purpose—that of storing an amount of air large enough to instantly release the brakes of a train after an application; and if it is not large enough to fulfill new requirements, the remedy is to make it larger.

"Another objection raised is that running switches cannot be made. This is true. But most railroad managers would consider this a point in its favor. At terminals, where trains are broken up, switchmen separate all hose and bleed all cars before commencing to rearrange the trains, so that in this operation the angle cuts no figure.

"Whatever objections may be brought forward against removing angle cocks from cars, they do not apply to engines; and of all the angle cocks in use, those on the engines are most liable to be, and oftenest are, found closed. This being a fact, and our experiments in removing angle cocks being so successful, our manager decided to remove all angle cocks from engines. This has been done, blind couplings being substituted, into which the air hose at front of engines and rear of tenders are coupled when engines are not attached to a train or car."

The blind coupling referred to is shown in Fig. 1.

Another arrangement for guarding against the danger of running a train in which the engineman has been deprived of the control of the brakes without his knowledge is illustrated by Fig. 2, which shows a device invented by Mr. E. P. Bishop, a locomotive engineer on the Louisville & Nashville. The essential feature of this is a valve on the train signal pipe, which must always be open, making it impossible to put the signal pipe in service, except when the main air pipe is open, *i. e.*, in working condition. The handle of the angle cock, A, carries a cam, B, which, when A is closed, presses against a valve in pipe C, allowing the air to escape from the signal pipe. An accommodation train of the Louisville & Nashville has been equipped with this apparatus.

Mr. Pulaski Leeds, Superintendent of Machinery of the Louisville & Nashville, advocates stricter discipline as one of the best ways of insuring safety in handling angle cocks. He would put a lock on each handle and require as much care in this duty as in locking switches. To simplify the matter he has designed a three-way cock with a gravity lock, which could be placed in the middle of a car, so that any one car could be cut in or cut out by a single operation. Placing this valve under the middle of the car would put it out of the reach of the tramp who rides on the "blind baggage" and incidentally would remove a chief element of mystery from accident investigations in which the brakes are said to have failed.

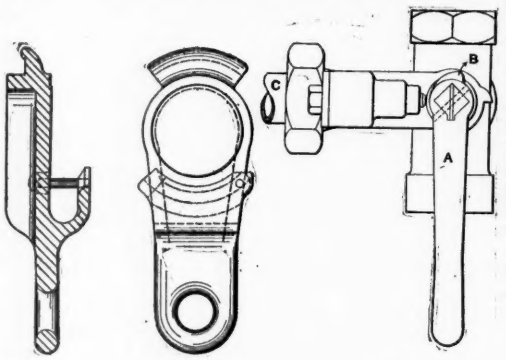
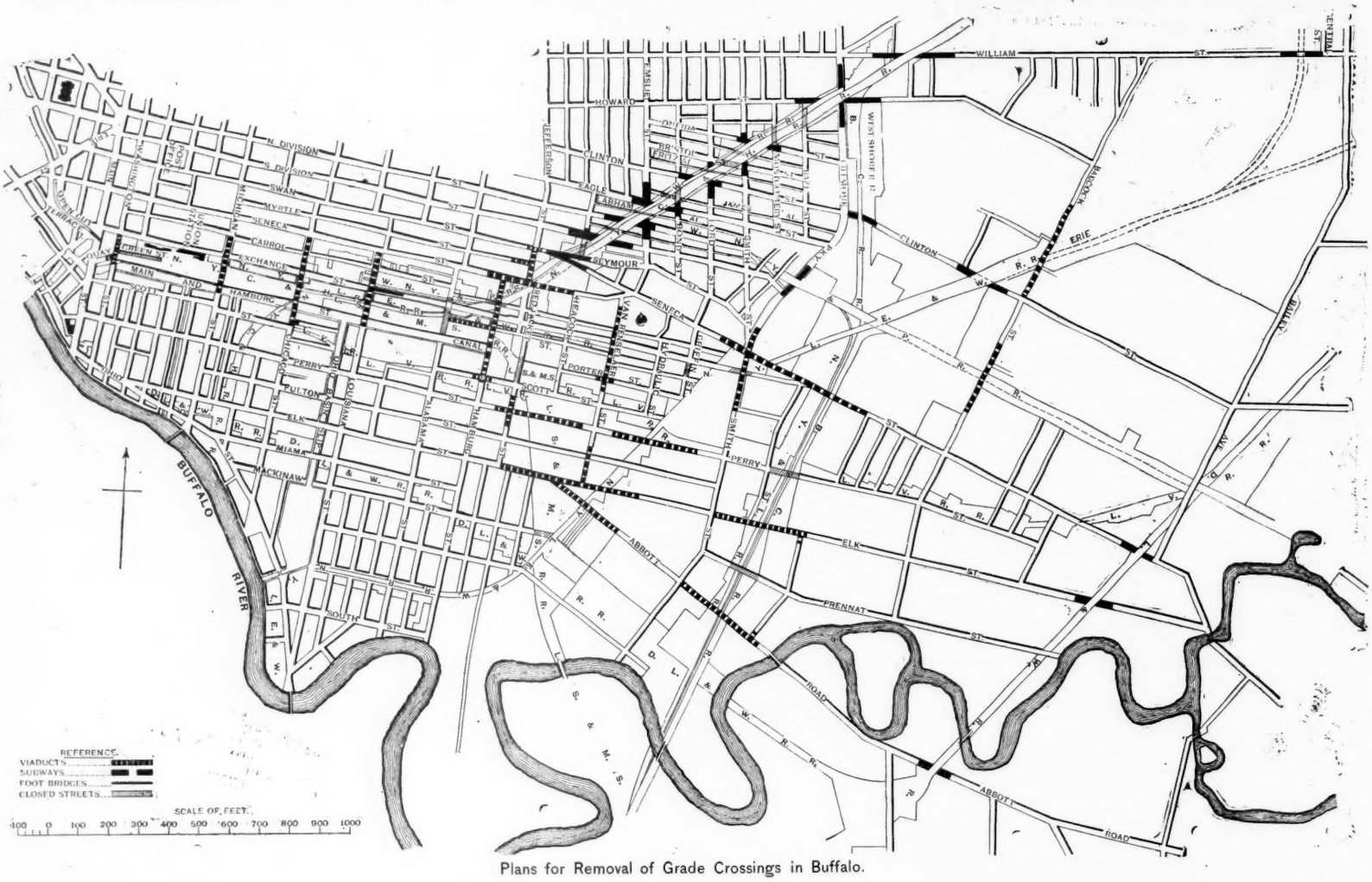


Fig. 1. Fig. 1a. Fig. 2.

Cost of Removal of Grade Crossings in Buffalo.

We give herewith a map of the city of Buffalo, showing the revised plan of the improvements and changes which will in general be made in that city to remove crossings at grade. The changes relate to changes of streets, thus, viaducts are street, not railroad, viaducts and the same is true of the subways. Advertisements have been published by the city asking for bids for the city's portion of the New York Central work at Michigan, Washington and Main streets and the Terrace. The approximate cost of the work has been estimated by the engineer of the Grade Crossing Commission. The total cost for the entire work will be $4,956,165, of which the cost to the city will be $873,670, while the railroads will have to pay $4,082,495. Of this the greatest cost will be borne by the New York Central and West Shore railroads. The improvements along the lines of these two roads embrace viaducts, subways, etc., at 22 different streets, and the cost of these improvements will be $2,009,276. The road bearing the next greatest expense in this estimate is the Erie. Its pro-rata share will be $917,594, comprising improvements at 12 streets. The Lake Shore & Michigan Southern will have four viaducts at a cost of $339,412. The Western New York & Pennsylvania will make improvements at 12 streets, costing in all $423,253. In addition to these the Buffalo Creek will pay $145,062, the New York, Chicago & St. Louis $123,960, the Union Terminal $57,216, and the Delaware, Lackawanna & Western $59,071. Of the entire cost apportioned to the railroads, $247,016 will be expended in raising tracks. It should be noted that the figures, as given above, do not include cost of land or land damages. They are the result of the estimate of the Commission's engineer, and are based upon the plans and specifications, but are subject to change when the exact apportionment of expense to be borne by the contracting parties is made. Any such changes, however, will not be large.

We are indebted to Mr. Edward B. Guthrie, Assistant City Engineer, for the map as well as for the description of this work which appeared in our issue of March 8.



Plans for Removal of Grade Crossings in Buffalo.

The Santa Fe, Prescott & Phœnix Railway.

BY M. J. LORRAINE, C. E.

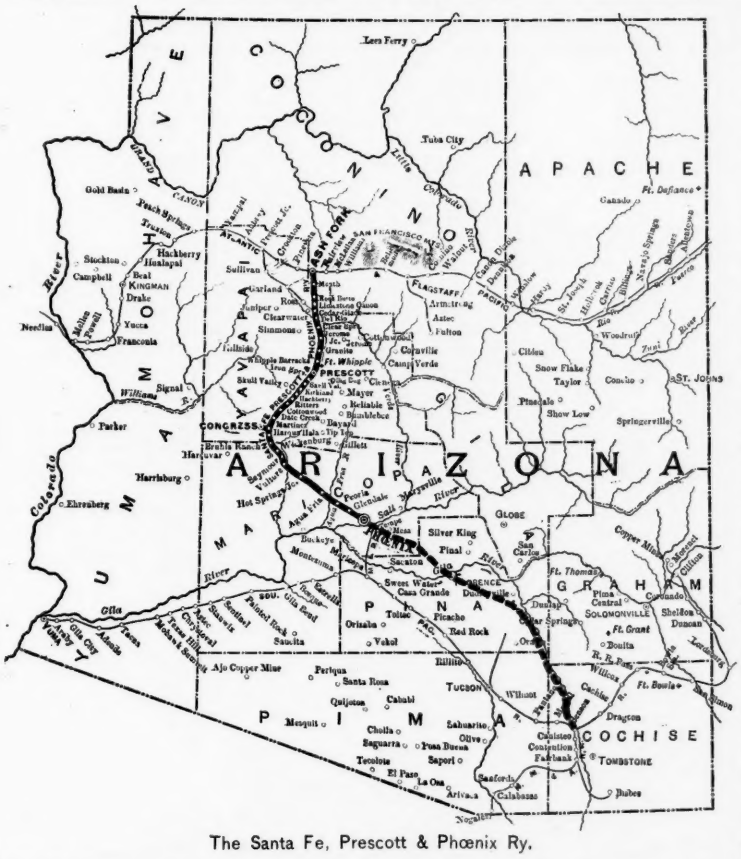
The Territory of Arizona stands first among the States and Territories of the United States for new railroad mileage constructed in the year 1894. The largest part of such construction work was done on the Santa Fe, Prescott & Phœnix Railroad, a line beginning at Ash fork, on the Atlantic & Pacific, and completed southward to Phœnix, Arizona, a distance of 196 miles. The track was laid to the last named point Feb. 27th last.

Previous to the building of this road the only railroad in Arizona making connection with the Atlantic & Pacific was the Prescott & Arizona Central, extending from Seligman or Prescott Junction, 74 miles; having a mon-

opoly, excessive rates were charged, almost prohibitory for many classes of freight. The principal business of Northern and Central Arizona is mining, and on account of the heavy railroad freight rates, such extensive shippers as the Congress, Jerome, Hillside and other mines which are tributary to Prescott, found it desirable to haul their concentrates or copper matte, with long mule teams, many miles over heavy mountain roads to the shipping point, returning with feed or supplies for their camps. These freight teams consist of 18 or 20 mules or more, usually pulling about three freight wagons having a capacity of five tons each, or about three-fifths of the capacity of the ordinary freight car. Their rate of progress is about 12 miles a day, taking about 10 days to make the round trip between Congress and Prescott, a distance of 125 miles.

In 1889 "Diamond Joe" Reynolds, owner of the railroad into Hot Springs, Arkansas, and the Diamond Joe line of steamers on the upper Mississippi River, and who owned the Congress mine in Arizona, undertook the construction of a railroad south from Ashfork, with the intention of building to Congress, and obtaining an outlet for the product of his mine without being subject to the heavy railroad and freight team toll. Later other mine owners became associated with the enterprise to carry it through to Phœnix, and it is now contemplated to extend the line to Benson to unite with the New Mexico & Arizona Railroad, thus obtaining connection with the Gulf of California. The last named road is owned by the Atchison, Topeka & Santa Fe, with which company and the Atlantic & Pacific traffic arrangements have been completed.

The Santa Fe, Prescott & Phœnix line, crossing a mountainous country, finds it necessary to use in places heavy grades. Its maximum grades are 1.5 per cent.,



The Santa Fe, Prescott & Phœnix Ry.

and the sharpest curves are 12 degrees, but a double maximum, or pusher grade of 3 per cent. is used for short distances. The 3 per cent. grades are north between Rock Buttes and Cedar Glade, about four miles; south below Prescott to Summit, three miles, and north from Ramsgate to Summit, seven miles. The bridges on the line are pile and trestle timber structures, with the exception of those across the Hassayampa and Aqua Fria Rivers, which are Howe truss timber spans, the former having two spans of 150 ft. each, the latter three spans of 150 ft. each. The largest trestle bridge is at Ramsgate, being 500 ft. long and 85 ft. high. There are 331 bridges of all classes between Ashfork and Phœnix.

The new railroad shortened the distance over its competitor between Prescott and the Atlantic & Pacific 14 miles, and since its opening into Prescott, in April, 1893, the Prescott & Arizona Central has suspended business and the recent heavy floods have washed away much of its roadbed and many of its bridges.

In addition to mining, the northern and central part of Arizona is devoted largely to stock raising, and the southern portion, especially the Salt River valley, of which the town of Phœnix is the center, is susceptible of the highest cultivation, producing in abundance all the semi-tropical fruits and farm products. The future of the Salt River valley as an agricultural country is dependent on irrigation, which is largely done, and two great irrigating canal projects are now under way. One, the Rio Verde Canal, a contract to build which has recently been made with the firms of Langdon, Linton & Co., Minneapolis, and Donald Grant & Co., Faribault, Minn., involves an initial expenditure of $2,000,000 and includes the construction of a vast storage reservoir upon the Verde River, 55 miles from Phœnix; of a high diversion dam further down the stream, and about 80 miles of canal which will carry enough water to irrigate 200,000 acres of land. The other enterprise is the celebrated Walnut Grove dam on the Hassayampa, which was carried away by the flood in 1890, with much damage and loss of life. This will be rebuilt during the present year.

An idea of the character and extent of the railroad traffic will be obtained when it is known that the Congress mine turns out for shipment 1,000 tons of concentrates monthly; that the great Jerome mine was rich enough to warrant its owner building, within the last year, 23 miles of difficult mountain road, narrow gage, to a connection with the Santa Fe, Prescott & Phœnix, costing a quarter million dollars, and solely to transport ore and supplies for the camp; that the Little Jessie, Hillside, Gladiator, Vulture, Yarnall and Stanton camps and many other mines are producing and in operation, and employ thousands of men and animals who must have supplies; that there is fine building stone which the railroad has made it possible to quarry and utilize; that the cattle and agricultural products will now go by rail to market, and that the not unimportant passenger travel between the mines and their supply points will be secured by the railroad. The revenue of the new road on the portion already operated has been satisfactory, and now that the road has reached its terminus, and the most productive part of its territory, its traffic will be heavy from the beginning. It has been operated into Prescott, 60 miles south of Ashfork, since April, 1894. The Congress mines are 70 miles south of Prescott, the track having reached that important point last November. Phœnix is 70 miles still further south.

As is common along the line of the mountain railroads of the West, the scenery on this road is attractive, and many uncommon forms of vegetation are found along the route.

The Santa Fe, Prescott & Phœnix Railway was opened for regular business March 11, at which time enthusiastic opening ceremonies drew many thousands of people from all the surrounding country. The citizens of Phœnix made this what is termed a "gala occasion." The jollification lasted over a week. It was a great time for Arizona, and its capital city.

The company owns 8 locomotives, 6 passenger coaches, 4 combination coaches, 25 standard box and 50 platform cars. The rails are 57-lb. and 65-lb. sections. The line is standard gage.

An agreement has been made with the Atchison, Topeka & Santa Fe by which the Santa Fe, Prescott & Phœnix secures an arbitrary five per cent. of the gross earnings of the entire Atchison line, on all business interchanged between the two roads. This contract is for thirty years. The funds due under it are payable to the trustees of the first mortgage bonds, the Mercantile Trust Co., of New York, to meet the interest payments. The first mortgage bonds amount to $3,500,000, and carry five per cent. interest. A second mortgage for $3,000,000 has been also authorized.

The success of this enterprise is largely due to the energy and ability of President Frank Murphy, manager for "Diamond Jo" mining properties, and to Mr. G. W. Vaughn, who has been Chief Engineer during the entire construction and is now Vice President and General Manager. Mr. D. B. Robinson, the first President of the road, did much for the project in a critical period of its history. He resigned when he left the Atlantic & Pacific to go to Chicago as Vice President of the Atchison, Topeka & Santa Fe. The work has been carried along, without interruption, through a period of abnormal business depression, and this is due to the unhesitating confidence of its financial supporters in the developement of the country, as soon as it could be opened up by the railroad. Of course, only men of large financial resources could carry such an important work in such times, and as its directors include N. K. Fairbank of Chicago, C. D. Arms of Youngstown, O., D. M. Ferry of Detroit, representatives of the Reynolds estate, all of great wealth, and heavily interested in the railroad, there has never been the slightest question of the successful issue of the plans for the construction of the road. But it required great courage to keep the work going along steadily, in the last two years. The company's supporters are now in a position to look for returns on their heavy expenditures, and their returns ought to be large. Whatever profit they may secure, it will surely be an extremely small part of the increased value they have given to Arizona resources.

The Russell Snow Plow on the New York Central.

Our readers will remember that the Russell snow-plow did very good work in clearing the tracks of the New York Central after the serious storm of Feb. 8 and 9. Mr. J. W. Russell, the agent for the sale of this plow, who was personally in charge of the work on the New York Central, thinks that the performance of the machine on this occasion deserves further notice, and he has sent us a long communication, giving details of what was done, prefaced by a statement of what very unsatisfactory results attended the work of the rotary and other plows. His article is entitled: "Can Snow Blockades be Avoided," and it is only fair to say that, with a sufficient number of Russell plows, *with Mr. Russell upon them*, his assertion that the answer should be in the affirmative, makes a very good showing.

The Russell plow was described in the *Railroad Gazette* of Oct. 23, 1891. It has the appearance of a common push plow, but has been designed with great care by men who have had long experience in "bucking" snow. The main peculiarity of this plow is the "power bar," of white oak timber 12 in. × 12 in. in section, and as long as the body of the machine. The front end of this bar is connected to the frame over the centre of the forward truck, and it abuts against the "backbone" of the inclined front end; its rear end extends to and beyond the rear end of the plow, and is coupled directly to the engine. The power of the locomotive is therefore always applied at the front of the plow and not at the rear. The Russell plow also has a "wing elevator" on each side, consisting of three adjustable concave blades or mold boards, which can be opened out so as to clear the snow from a width of 16 ft., or 3 ft. on each side more than is necessary for the widest passenger car. The plow used on the New York Central was the one exhibited at the World's Fair; it is a No. 2, and weighs 65,000 lbs. It is 40 ft. long and 11 ft. 8 in. high.

The claims made by the manufacturers for this plow are based on the features we have named and on its generally scientific construction, by which those who have handled the plows are inspired with confidence that no snow bank, however uneven, one-sided or hard packed, can throw the plow off the track. With this confidence the person in charge, on approaching a big drift, puts on steam and attacks the obstacle at high speed. This is a vital element in the difference between a successful and an unsuccessful push plow. Mr. Russell appears to have infused his confidence into the enginemen on the New York Central and to have succeeded accordingly. Indeed, his answer to our question—why he did not use three medium size engines instead of two large ones, illustrates a well-known difficulty in dealing with deep snow: "Because," said he, "I seldom find three runners who will all have the necessary courage; one of the three is pretty sure to be timid."

The Russell plow started east from Buffalo on the afternoon of Feb. 10 and ran to Batavia, 36 miles. Drifts 5 ft. deep, 500 to 600 ft. long, were encountered and easily cleared. On Monday, Feb. 11, the plow, pushed by two mogul engines, with cylinders 19 in. × 26 in., started east from Rochester to clear the Auburn road, which had been completely blocked for three days. The drifts between Brighton and Pittsford were very bad and had been reported 15 ft. and 20 ft. deep. Realizing the conditions, Mr. Russell informed the trainmen that his plow was not a new-fangled thing, that it had been in use eight years, and that it had never been thrown off

The Russell Wing Elevator Snow-Plow.

the track by any deep drift or hard bank of snow. Thus encouraged, they started out at 35 miles an hour and soon struck a drift higher than the plow, which of course covered the whole train with snow and made it impossible to see anything; but more steam was applied, and they went through all right. In this stretch of four miles there was probably 4,000 lineal feet of snow, from 3 ft. to 15 ft. deep. Similar drifts were found all the way to Paddleford, but the trip was made without difficulty and without stopping, except for water, and they arrived at Canandaigua in three hours and a half from Rochester.

Mr. Russell went over the road afterward and estimated the size of the drifts as follows: First four miles from Brighton, one drift 10 to 15 ft. deep, 300 ft. long; two drifts 7 to 10 ft., each 650 ft. long; four drifts 3 to 9 ft. deep, each about 200 ft. long; several others nearly as

large. For the next dozen miles there were a half dozen big drifts, the largest of which was 3 to 10 ft. deep and 2,250 ft. long. In the next nine miles there were a dozen drifts as deep as these and averaging 1,000 ft. in length.

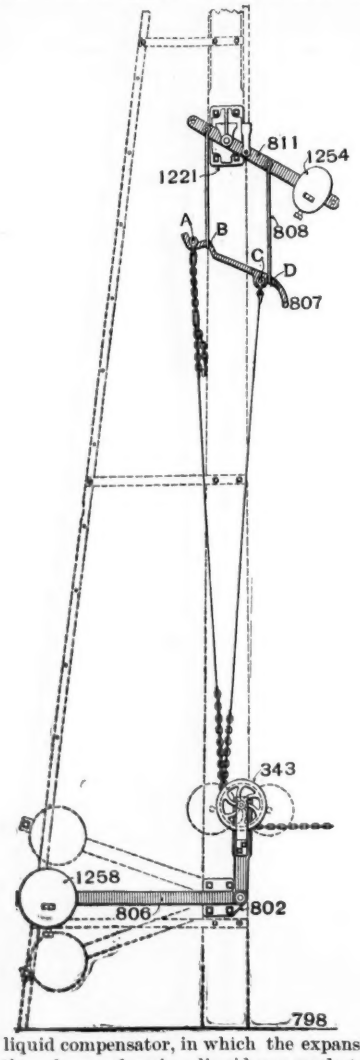
On Feb. 12 the plow was started eastward to Syracuse, 74 miles, the road having been blocked since the 8th. Here again drifts were encountered which were higher than the plow and several hundred feet in length, all of which were run through without stopping. On this day there were three engines, and one of the runners was rather faint-hearted until they got through the first big drift, after which he was all right. On this section of road Mr. Russell found a longer stretch of track buried with snow than he ever saw before; it was from 1 ft. to 5 ft. deep for over five miles, and, the road being somewhat crooked, the mass of snow thrown up by the plow was continually alternating from the right-hand side to the left. The run of 74 miles was made in four hours. Several stops were made, one of them for luncheon, and there were delays on account of bridges, over which the three engines were not run together.

On the 13th a drift was cleared near Greece, on the Falls road, which was 1,100 ft. long and 15 ft. deep in several places. Up to this time 35 shovelers had wasted their time following the Russell plow around in a caboose; but now the officers of the road had begun to see that the plow was equal to anything, and the men were left off. On Feb. 22 the Russell plow was run over the Falls road with the wings extended, to widen the cuts that had been made in opening the road after the storm of Feb. 20. This was done successfully, a path 16 ft. wide being made; and Mr. Russell thinks that he did as much work of this kind in one hour as a rotary plow could do in a day, and at only a fraction of the cost of doing it with the latter. The accompanying cut is from a photograph taken of the plow on this trip at Albion, N. Y.

In view of all the foregoing, Mr. Russell says that the question asked at the beginning of his article is answered without discussion. The Russell plow will cope with side hill and diagonal drifts with sufficient speed to go through without stopping, and as the plows are not costly any road should have enough of them to prevent the formation of drifts any worse than those referred to in this account. It is imaginable that a drift 1,500 ft. long and 20 ft. deep might stall a Russell plow, but he has never seen or heard of such a drift as that; and, as was just said, nothing but poor management will allow such a quantity of snow to accumulate on the track

The Johnson Signal Wire Compensator.

The accompanying illustration shows the construction of the compensator usually put up by the Johnson Signal Company, in connection with distant signals. It will be remembered that Mr. Henry Johnson, General Manager of this company, was the inventor of the well-



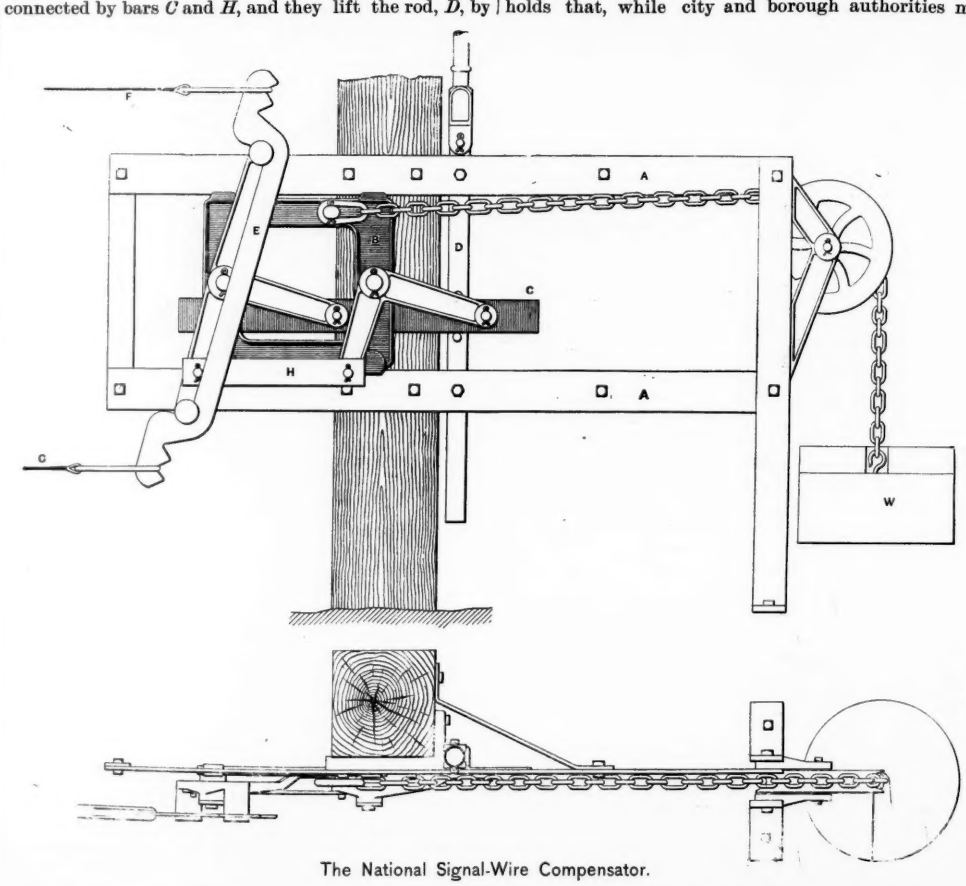
known liquid compensator, in which the expansion and contraction of a non-freezing liquid was made to act on a piston so as to take up and pay out the signal wire whenever the length of the latter was varied by changes in the temperature of the atmosphere. This compensator worked well when properly cared for, but is now little used on account of the expert knowledge required to keep it constantly in perfect condition.

The apparatus shown in the drawing herewith acts simply as a wire stretcher. The weight, 1258, draws the wires taut by pulling on the pulleys, 343, the front-wire and back-wire pulleys being on the same axle. The weight can be adjusted on the rod, 806, at any desired distance from the fulcrum, 802. To insure the movement of the signal arm to the danger position in case of breakage a disengager, 807, is hung from the balance lever, 811. If the back wire, attached at C, should break, any pull on the front wire, attached at A, would lift the disengager from the loops which support it at B and D, and the signal would remain in the danger position. As the connections A and C are both on the safety side of their respective bearings, B and D, the accidental movement of the signal to the clear position is effectually guarded against.

Compensators of this kind have been put in use on a number of roads during the past three years and good reports are received of them. Their chief merits are simplicity and cheapness.

The National Signal-Wire Compensator.

The engraving which appears herewith shows the construction of the compensator for distant-signal wires manufactured by the National Switch and Signal Company. This device is the well-known Mitchell & Stevens patent, and it is used extensively on the Erie, the Lehigh Valley, the Philadelphia & Reading and other roads. The main pivots are fixed to the movable "cage" *B*, which slides horizontally between the two horizontal members of the main frame, *A*. The operation of the compensator is simple and it requires no adjustment other than that made automatically by the weight, *W*. On pulling the back wire, *F*, and slacking the front wire, *G*, the two parallel bell cranks are turned up simultaneously, being connected by bars *C* and *H*, and they lift the rod, *D*, by means of one of the two pins between which the bar, *C*, slides. If either wire should break while the signal was at safety the arm, *E*, would be pulled off its bearings by the other wire, and the rod, *D*, would be pulled up by the action of the counterweight connected with it near the top of the post, thus throwing the signal to the danger position. As the horizontal movement of the bar, *C*, between the pins on the signal rod, *D*, is perfectly free, the effect on the rod, *D*, is in no way changed by the expansion or contraction of the wires. It is found in practice that the weight, *W*, need never be heavier than 200 lbs., so that there is no excessive strain.



The National Signal-Wire Compensator.

English Compensators.

In connection with the general subject of wire compensators, of which two well-known patterns are shown on this page, we have asked Mr. J. P. O'Donnell, of London, to send us drawings of the best English devices, and he has favored us with those shown herewith. It will be remembered that in England distant signals are generally, if not universally, operated by a single wire, a practice which simplifies the question of compensation.

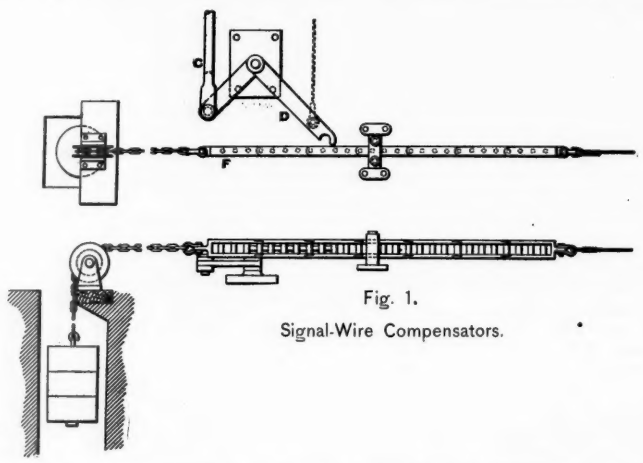


Fig. 1.

Signal-Wire Compensators.

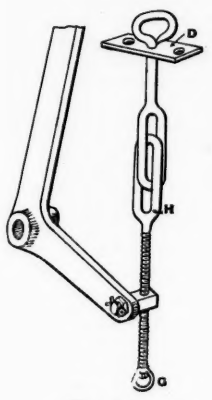


Fig 2.

Fig. 1 shows Russell's patent of July 27, 1892. The wire extending to the signal is connected with the horizontal ladder, F, and is held taut by a weight, as shown. The signal lever in the cabin is made to engage this ladder by means of the rod, C, and the crank or prong, D.

Fig. 2 shows a device for adjusting the length of the wire so as to obviate the necessity of using an automatic compensator. This is the invention of Mr. J. P. Annett, and was patented Aug. 27, 1886. The essential feature of the device is the handle, connected by a loose joint, which extends up through the floor on which the signal man stands, so that he can alter the length of the connection between the machine and the signal without leaving his post of duty.

Rights of Electric Street Railroads in Pennsylvania.

The Supreme court of Pennsylvania on March 26 delivered an opinion in the case of the Pennsylvania Railroad Company, appellant, against the Montgomery County Passenger Railway Company, appealed from the Common Pleas Court of Montgomery County, which holds that, while city and borough authorities may grant the use of the public streets to electric roads, township authorities have no such power, and in consequence a long distance trolley road which crosses a township in any part of its route cannot lawfully be constructed in Pennsylvania without purchase of right of way from private owners.

The Philadelphia *Press* summarizes the decision as follows:

This decision will halt the construction of long distance trolley lines all over the state. As these lines are incorporated under the Street Passenger Railway act and have no right of eminent domain they can lay their tracks only on land which they own or control or on public highways with the consent of the local authorities. But when it comes to stringing them together from city to city in one continuous line this decision raises a difficulty. The authorities of a city or borough have the right, says the Supreme Court, to impose this servitude of a through trolley line on their streets, but not so the township supervisors. Their authority over their township roads is limited to grants for strictly township purposes. The carriage of passengers through a township from one city or borough to another city or borough, whether by steam or by trolley, is not a township purpose in the view of the Supreme Court, and therefore a township road cannot be subjected to such a servitude without the consent of the adjacent property holders. As they cannot be reached by eminent domain or through the local authorities the Supreme Court is unable to see how country roads can be occupied by trolley lines, except by private contract with every owner of property along the line.

The Supreme Court does not push its opinion to the extreme logical conclusion. It says that the trolley lines that have been built on country roads without proper authority cannot now be interfered with. . . . The Court holds, further, that no part of a contemplated trolley line can be built whose route lies through a township until the company has the right to build an entire line. This is a clincher, since it stops the long distance trolley line construction altogether. . . . The Court declares that there is no authority to build a long distance trolley road or any portion of it under the present law of Pennsylvania.

The Fay Back Pressure Reducer.

This is a device, consisting of an arrangement of ports in the main valve and cylinders, which has for its object the reduction of the back pressure and the compression by permitting the steam in front of the pistons to pass under the steam valve and through small passages to the opposite end of the cylinder, the port in the steam valve being so arranged as to permit this to take place at any desired point in the stroke. Figs. 1 and 2 show the arrangement of ports. The small passages, which may

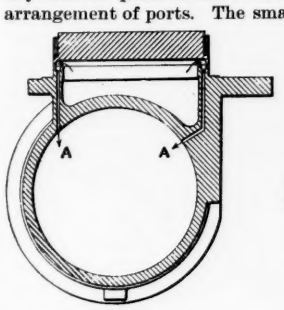


Fig. 1.

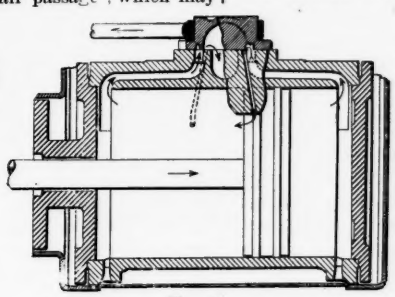


Fig. 2.

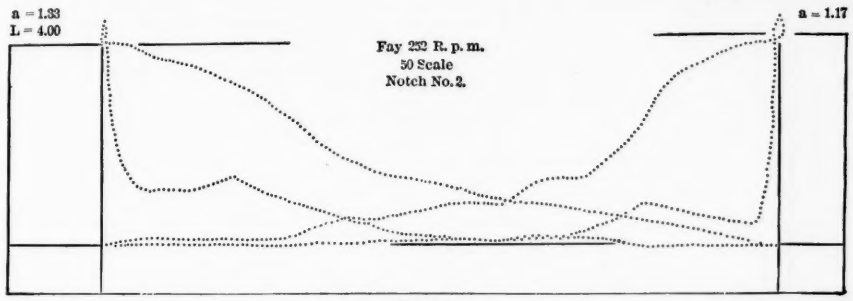


Fig. 4.

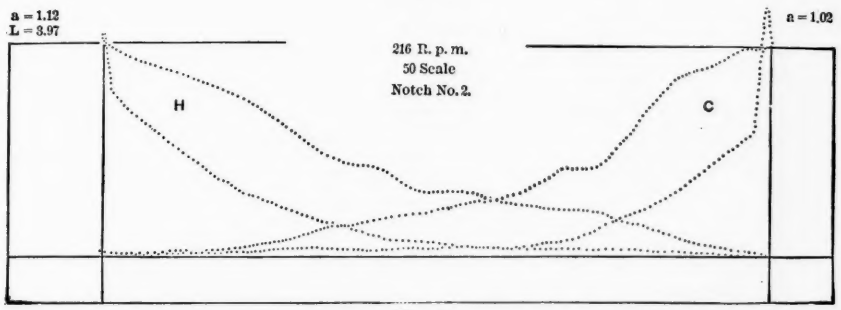


Fig. 3.

be said to be the "releasing passages," are marked *A* in Fig. 1, and are opened by the small ports in the face of the valve at the point in the stroke of the piston where it is desired to relieve the back-pressure. The effect of this device on back-pressure is shown by comparing Figs. 3 and 4. Fig. 3 is an indicator card taken from a stationary engine before the device was applied. The reduction of the back-pressure in Fig. 4 shows the effect of opening the release passages. The speed of the engine was about 250 revolutions a minute.

A locomotive, No. 173, on the Boston & Albany railroad, has been equipped with this device, and has been in service since June, 1893. It is said that the device on that engine has reduced the back pressure about 38 per cent. Instructions for arranging the ports and further information can be obtained from Henry R. Fay, Boston, Mass.

The Santa Ana Irrigation Canal.

The following abstract is from a paper read by Mr. William Ham. Hall before the American Society of Civil Engineers at the meeting of Feb. 5. The main object of the Santa Ana Canal is to furnish water for irrigation and domestic use for about 45,000 acres of land in the northern portion of the San Jacinto Plateau, Cal. The main source of supply is the Santa Ana River, re-enforced when necessary by water from a storage reservoir in the San Bernardino Mountains, impounded during the flood period. It was determined to first complete the aqueduct to one-half its capacity only, for several season's use, before completing any portion to full capacity, but all parts were planned for the full size. The total length thus finished was 29,095 ft. The cost of earth and rock work thus far has averaged 48 cents per cubic yard.

The paper deals with the parts made ready for use in divisions I. and II. at the head of the pipe line, only covering about one-sixth of the length of the work, and for the most part finished for about one-half of the capacity. This embraces nearly all of the heaviest construction and covers an unusual variety of construction.

The intake is in the vertical face of a solid rock point, through a tunnel 220 ft. in length, to where a side cañon enters, carrying at times of heavy rains a mass of detritus. To avoid taking this into the conduit, the location was kept in the hill and the work built as a walled canal in cutting, so that the side torrent may be carried over it.

The cañon bed drops away at rates from 160 to 125 ft. per mile, while the hydraulic gradients were less than 10 ft. per mile, so that the aqueduct rapidly climbs the mountain side. Nine mountain spurs are pierced by tunnels whose aggregate length is 4,329 ft. Three large transverse cañons are crossed by pressure pipes, with a total length of 21.27 ft.; nine reaches of flume have an aggregate length of 11,395 ft.; one piece of walled canal has a length of 152 ft., and eight masonry structures cover 173 ft. in length of line. There are 39 substructures, consisting of girders or combination Fink truss spans, with an aggregate length of 1,905 ft.

In division II., as now finished, there are eight stretches of canal, with a total length of 8,214 ft., nearly all lined with rubble in mortar. There are seven reaches of flume, aggregating 2,706 ft., crossing six gulches and the wide torrent bed of Mill Creek. The gulch crossings are supported by string girders and trussed wooden girders and wooden piers on masonry footings, with an aggregate length of 1,440 ft., and Mill Creek crossing is made by a riveted steel bridge 1,072 ft. long.

Of the nine tunnels in division I., eight are through rock and were driven by contract. The ninth, through cemented gravel and boulders, was driven by day labor. The specifications under which contracts were let provided that the contractor should furnish all the material, tools and outfit, except the lumber for lagging and timbering. All tunnels were uniform in cross section, provision being made for variation in excavated section where timbering would make it necessary.

The specifications were stringent as to the exercise of care in not shattering materials driven through, and to avoid timbering as far possible. Experience in California is that contractors will blow the hill to pieces in order to cheapen work. There was a penalty for excessive excavation behind the neat line, beyond a 6-in. average limit for any 10 ft. of tunnel, as well for other bad results due to careless blasting. This penalty was a charge of 40 cents per cubic foot of the concrete it would take to fill the unnecessary excess. In the climate of Southern California, portal walls and arches of masonry can usually be omitted.

Tunnel No. 9, 510 ft. long, was subject to air slacking. A special experiment in the use of wood lining was introduced. The lining is made of 3-in. redwood staves, pressed into place and held within a shell formed by ramming concrete as a backing into the space between the staves and the face of the tunnel bore. To preserve the wood this tunnel is located more than its diameter below the grade, so that, no matter how little water may be running, the staves remain always thoroughly soaked. The lining was built in lengths of 8 to 14 ft. each. The staves of the succeeding lengths were broken-jointed with an end lap of 4 ins., and the end joints were made between each two abutting staves, with a metal tongue taken into a saw kerf in the staves' ends. The staves were a little less than 8 ins. wide, with the edges milled to radial lines of the circle, and with a ⅛-in. bead on each edge one-third the thickness from one side.

The entire tunnel proper will be under a pressure head of between 1 and 3 ft. at its top plane when there is any water whatever running in the aqueduct, and between 7.3 ft. and 9.3 ft. when the full 240 second-feet are flowing. At the up-stream end it flares in 16 ft. of length to an oval, having horizontal and vertical axes of 114 and 72 in. respectively. This was done to receive with the least disturbance of current the water from two 52-in. pressure pipes laid side by side and 6 in. apart. There is a gateway provided at the down-stream portal to close it sufficiently to always keep the wood lining of the down-stream extension wet, no matter how little water may be running.

Calking was resorted to whenever there was any indication that a seam was not thoroughly closed. Such lining guards better against rupture by earthquakes than any other, and the planed wooden face diminishes friction and materially increases capacity. The wood lining cost $4.28 per linear foot, and the lining complete $8.11; the tunnel complete, $12.64.

The three pressure pipes of the line cross three cañons. They are pipes made of redwood staves, bound with round steel rods, with the end joints closed by metal tongues let into saw kerfs in the stave butts. They were used instead of iron or steel to save expense, and also because they could be laid wholly above ground and thus save cost of excavation and back filling, whereas, owing to the temperature, metal pipes would have required covering.

Cost of Generating Steam With Eastern and Western Coal.

BY J. C. M'MYNN, M.M.E.

It may be interesting to some owners of plants to know what average evaporation of water per pound of coal is obtained in Chicago under ordinary running conditions, and below we give some averages obtained from tests carried out by Robert W. Hunt & Co., consulting engineers, who have a department devoted to conducting efficiency tests of boilers and furnaces.

Eastern coal, burned in plain furnaces (average of 11 tests):

Price per ton delivered	$2.91
Water evaporated per lb of coal from and at 212 degrees	8.35 lbs.
Cost of evaporating 1,000 lbs. of water from and at 212 degrees	17.6 cents.

Eastern coal, burned in patent smokeless furnaces (average 10 tests):

Price per ton delivered	$3.06
Water evaporated per lb. of coal from and at 212 degrees	9.32 lbs.
Cost of evaporating 1,000 lbs. of water from and at 212 degrees	16.4 cents.

The above 21 tests included tests of Pocahontas, New River, Youghiogheny, Winifrede, Pittsburgh and Hocking, and were made under the ordinary conditions of the different plants.

Western coal, burned in plain furnaces (average 11 tests):

Price per ton delivered	$1.60
Water evaporated per pound of coal from and at 212 deg	6.9 lb.
Cost of evaporating 1,000 lb. of water from and at 212 deg	11.6 cents.

Western coal, burned in patent smokeless furnaces (average 15 tests):

Price per ton delivered	$1.38
Water evaporated per pound of coal from and at 212 deg	7.42 lb.
Cost of evaporating 1,000 lb. of water from and at 212 deg	9.3 cents.

The above twenty-six tests include tests of Illinois and Indiana lump, nut and screenings.

Briefly analyzing these results, we see that a patent smokeless furnace does not make the same increase of saving on eastern coals as it does on the cheaper grades of western coals. Many plants are so situated and arranged that it would not be economy to burn anything but the best grade of eastern coal or oil, while in others where ample capacity is provided the cheaper grades can be used to advantage. The cheaper the fuel the cheaper the cost of steam, within a certain limit, which limit is when the interest on the extra investment for boilers more than equals the saving made.

Comparing eastern and western coals burned on plain grates, the price of the western coal is 55 per cent. that of the eastern, while the evaporation per pound of coal is 82 per cent. of that obtained from eastern coal, and the cost of evaporating water is 66 per cent. or 34 per cent. saving on plain grates, leaving out the question of capacity entirely. When burned in some standard smokeless furnace (no steam jet devices averaged in), the price of the western coal is 45 per cent. of the average price of eastern coal, but the evaporation is 80 per cent. of that obtained from the $3.06 eastern class, and the cost of evaporating water is only 57 per cent., or a saving of 43 per cent. made in using cheaper coal.

The patent furnaces save 6.8 per cent. in the cost of generating steam, using eastern coal as fuel, but they save 20 per cent. with western coals. This seemingly large saving is attributable to the fact that when no smoke is made the combustion is good, because of a larger amount of air being supplied to the smokeless furnace, which allows of the chemical reaction necessary to combine the volatile matter of western coals with the needed oxygen.

From the above it would seem that smoke prevention means economy, and also that the fuel near us can be utilized by Chicago manufactories with advantage and saving.—*Electrical Engineering.*

The M. C. B. Convention Hall.

The hall in which the technical conventions were to have been held at Alexandria Bay, in June, was recently burned. It was feared that the new hall could not be erected in time for the convention, but the citizens of Thousand Islands have pledged themselves to erect a new hall capable of seating 2,000 persons, and have it ready in time for the conventions.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

There is an aspect of the air-brake litigation which has been going on now for two or three years which is worth a moment's special consideration. Those who read the cases and decisions must be impressed by the fact that all the devices which have been passed upon in the courts have shown no attempts to establish new principles or new general methods of using principles, and few new details of methods. All have taken the great successful ideas of Westinghouse, and mechanical motions and connections which he is using or has discarded, and have attempted to arrange these in some new combination which should evade his patents. There has seldom been, indeed, a pretense of bettering his work; most designers have tried simply to do the work better or worse, only hoping to steer clear of technical infringement. We do not attempt to pass on the morality of this course. It is the course of the development of all successful inventions. A "pioneer invention" does not appear every day; most invention is simply variation from earlier work. But one is struck by the waste of money and of energy, and the obstruction to progress which have attended this air-brake matter. We cannot think now of any good that has come from the attempts to make a triple valve that evaded the Westinghouse patents, unless, perhaps, a reduction in the price of car equipment may be traced to it. On the other hand a great deal of money, time and intellectual work have been spent in the unproductive work of inventing and making scrap iron, and in fighting law suits. Some one must suffer from this waste, and on the whole it is probable that the railroads are the greatest sufferers. The delusive hope of getting something cheaper has kept some of them from using air-brakes, and the human energy spent in attacking property on one side and defending it on the other has been diverted from the useful work of improving and cheapening methods and apparatus.

Concerning a Suggestion for a Rapid Transit Tunnel.

We publish on another page a communication from Mr. von Emperger, suggesting what he considers an improvement upon the plans adopted for the rapid transit tunnel for New York City. We are inclined to think that Mr. von Emperger falls into an error which is common but radical with regard to the proper width of the tunnel, which the Commissoners have increased from 44 ft., as adopted by the former Commission, to 50 ft. In the first place Mr. von Emperger's citation of authority for a narrower tunnel is not fortunate. The case of the Manhattan Elevated, operating in the open air, is not parallel to that of a railroad operated in a tunnel, for the elevated structure permits workmen or others on the track to take refuge outside the tracks, and there is no limit to the room which could be given to trackmen on the outer side of the tracks. The citation of the Budapest example is not accurate, the clearance there being three meters, equivalent to 9 ft. 10 in., and not 9 ft., as given by Mr. von Emperger. Furthermore, the Budapest enterprise is a very small matter as compared with what is projected for New York City, both in extent and in volume of traffic. On the other hand, the Boston Transit Commission has adopted 48 ft. as the width of its subway, which is intended for the passage of street cars. The tunnel of the Chemin de fer de Sceaux as described in Mr. Parson's report to the New York Rapid Transit Commission, has a width of 49 ft. 4 in for four tracks, and the standard width for double track tunnels is 27 ft. Furthermore, the engineers, who have been called in consultation, have agreed unanimously, we believe, that 44 ft. is too narrow for a four-track tunnel railroad.

So much for the authorities. The object in giving increased width is not simply to pass the cars, nor is it for the direct accommodation of the public in any way, but more particularly for the accommodation of workmen in the tunnel. In a rapid transit tunnel, trains must be run at very frequent intervals for many hours in succession, and at quite short intervals for the whole 24 hours; and these trains must in the new system to be built for New York be run up to a speed of 40 miles an hour. Obviously these tracks must be inspected frequently, and it must be practicable to do some work on them at almost any time, and it is not sufficient to provide occasional refuges for workmen. In the case of the Simplon tunnel described in the *Railroad Gazette* Dec. 28, page 881, the experts reported that the distance of the tunnel walls from the axis of the tunnel should be 7 ft. 8½ in., so as to afford more standing room for the workmen during the passage of trains. This is for a single track tunnel supposed to have a capacity of 48 trains in 24 hours. We may say, as a general proposition, that the greater the number of trains, the greater their size, the greater their frequency and the greater the speed, the more space is required in the tunnel. Naturally this is speaking within limits. A tunnel large enough to take a five-car train every five minutes, at 40 miles an hour, would no doubt be big enough for any greater traffic, so far as the size of the tunnel alone affects the matter. Of course, there is still another consideration which is of considerable importance: by increasing the distance between tracks there is less liability of a train on one track fouling the other track in case of an accident.

Mr. von Emperger's idea of renting the vaults at $3.50 per sq. ft., would not, we fear, yield the revenue that he anticipates. The average rental of the new office accommodations in New York is less than $2.00 per sq. ft., and it is hardly likely that a greater price could be got for the vaults. Moreover, the only persons who would pay rent for the vaults are owners who now hold them either in fee or by payment to the city. Therefore, any rental to the operating company is out of the question.

On the whole we are less troubled over the question of the excellence of the Commission's plans than we are over the question of their being able to get *any* underground system built.

The Latest Air-Brake Decision.

The latest decision in the quick-action air-brake litigation goes a step further than those which have preceded it. It amplifies and carries on to a new conclusion the reasoning of Judge Lacombe in the decision rendered last December, and makes the Westinghouse position still more difficult to attack with any hope of success.

The recent history of this litigation may be found pretty fully set forth in our issues of Dec. 1, 1893, Oct. 23 and Nov. 16, 1894, and Jan. 4, 1895. Those articles told the story of the suits of the Westinghouse Company against the New York Company, resulting in the decisive victory of Westinghouse. We need not stop now to recapitulate the points and decisions in those suits further than to say that Westinghouse patent No. 360,070 was not involved in the earlier suits; but only in the one decided Dec. 27, 1894, and reported by us Jan. 4, 1895. Even in that suit the decision was limited to the consideration of the use of the "further traverse" of the triple valve piston to actuate an auxiliary valve. Now comes the decision rendered March 11, by Judge Morris, of the United States Circuit Court, sitting at Baltimore.

The Westinghouse Air-Brake Company brought suit against the Boyden Power-Brake Company for infringement of patent No. 360,070. This is the pioneer quick-action patent. As Judge Morris says: "It is the first of the Westinghouse patents in which he describes an additional function engrafted upon his automatic air-brake . . . which is intended to meet the difficulties of applying air-brakes quickly on long trains." We need not describe the results sought—now so well known; they were secured by an "unusual and further traverse" of the piston of the triple valve. The *form* of the device is not of the essence of the invention; the ends sought and the fundamental idea of reaching them by further movement of the piston, consequent on a "sudden large release of pressure in the train-pipe," make up the great pioneer invention.

In the suit just decided the claims alleged to have been infringed were 1, 2 and 4 of patent No. 360,070. Claims 1 and 4 are for the usual combination of parts, with *an auxiliary valve independent of the main valve*. Judge Morris denied infringement of these claims, but not in such a way as to depreciate the Westinghouse patent; he held, simply, that Boyden does not use an auxiliary valve. Westinghouse's description of an auxiliary valve is as independent of and performing none of the functions of the main valve; but Boyden's valve, which performs the function of the Westinghouse auxiliary valve, is also the main valve. So the defendant is held not to infringe claims 1 and 4 in the patent.

But infringement is found of claim 2. This is for the combination of the main pipe, the auxiliary reservoir, the brake cylinder and a "triple valve having a piston whose preliminary traverse admits air from the auxiliary reservoir to the brake cylinder, which by a further traverse admits air directly from the main air pipe to the brake cylinder." This is the claim that is infringed. Boyden makes use of the further traverse to get his quick action; but this, the judge says, is the gist of Westinghouse's invention. This is the feature which is infringed by Boyden, whose apparatus is ingenious and admirable, but infringes the principle of getting additional action in the brake apparatus by the further traverse of the piston.

This is what we mean when we say that the decision of Judge Morris goes further than either of those which preceded it. Judge Lacombe held that claim 1 of this Westinghouse patent covers completely the emergency valve so long as it is actuated by the piston of the triple valve. He held that claim 2 covers actuation of the emergency valve by further traverse of the piston. Judge Morris holds that claim 2 covers broadly, venting the train-pipe into the brake-cylinder, by the further traverse of the piston, even without an auxiliary valve.

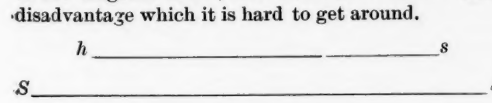
There still remains the possibility of getting quick action by venting the train-pipe elsewhere than into the brake cylinder. In this way quick action can be got, of course, but at such loss of power, stored in the air compressed by the pump that a brake apparatus designed to work in that way would be ranked as distinctly inferior, mechanically, to the standards now accepted. The loss is not merely in throwing away a part of the work done by the pump; but, what is more important, there is a loss of the braking power at the instant when it is most wanted. In an emergency application of the Westinghouse brake the air flowing from the auxiliary reservoir into the brake cylinder is reinforced by the air in the train-pipe, which, for the moment, becomes also an auxiliary reservoir. Judge Morris found this at first "paradoxical and startling," as no doubt do many railroad men who see the air-brake used daily and hourly; but it is true, nevertheless, that by the use of the train-pipe air in the brake cylinder the effective braking power is increased in practice 20 per cent., or from, say, 75 per cent. of the weight of the car to 90 per cent. Moreover, a brake venting into the air could not be interchanged with the Westinghouse. Still, people will, no doubt, try to get around the Westinghouse patents by venting the train-pipe into the air, and the courts will very likely soon be called on to decide whether or not Westinghouse controls also this method of getting quick action.

Competition of Electric Street Railroads.

The vexed question of trolley competition has to be met by railroad managers in many places. At Philadelphia the problem presents itself in an acute form, and the Philadelphia & Reading is reported to be preparing to take measures to regain some of the passenger traffic to and from Germantown which has gone to the electric street lines that have been established within the last year. The number of trains will be increased from 47 to 55 each way daily, and those which begin or end their trips at Germantown will run to or from the old station, which is nearer the center of the town than that on the line which runs through to Chestnut Hill. Evidently this old station was abandoned when the line was extended to Chestnut Hill on the ground that convenience of operation justified the railroad in asking the people to come to the cars; but now the stress of competition compels the cars to go to the people. The distance from the Market street terminal, Philadelphia, to Germantown is 7 miles, and the present round trip fare is 25 cents. It has not yet been decided whether to lessen this price, but a reduction to 15 cents is seriously contemplated.

The Reading in this case is not exasperated by the spectacle of a careless Legislature granting free

rights of way over country roads for new electric lines, which may or may not be backed by responsible men honestly aiming to supply a public need, for the street lines between Germantown and Philadelphia have long had a well-recognized field; but the practical conditions are about the same either way. The fact is, a ride in a 25-ton passenger car, warmed and ventilated, at 50 miles an hour, in greater safety than can be had on a street line at a half or a third of that speed, is a luxury, especially for short-distance passengers; and it is a luxury that thousands of such passengers think they cannot afford, even though they admit the inferiority of their new-found friend, the trolley-car running in the street. This being so, the high-speed railroad must carry passengers at rates unreasonably low or not carry them at all. And where the passenger finds the distance by the street from his house, *h*, to his store, *s*, only three-fourths as far as from station to station on the steam railroad line, as in the diagram below, the steam line has an added disadvantage which it is hard to get around.



We have called a cent a mile unreasonably low for a seven-mile ride. This would probably be true on any part of the Reading road, unless the passengers were always carried in full train loads, for it would leave too large a share of the fixed charges and semi-fixed charges to be paid by the other passengers, who pay two or two and a half cents; and certainly it is out of the question to stimulate travel in the country districts sufficiently to make a fifty per cent. reduction in rates profitable on the whole of the company's lines. But the low rate is especially inequitable here on account of the costly terminal facilities used by the Reading road. As Mr. Buchholz pointed out in a discussion of this subject in the *Railroad Gazette*, Dec. 2, 1892, a magnificent station and a commodious train shed and yard cannot reasonably be afforded for passengers paying only a few cents each. Such buildings are justifiable only for passengers whose journey is so important that they have to take baggage, need time in which to get their tickets and pick out their seats, and need, occasionally, a luncheon. Cars which carry nothing but five-cent passengers cannot afford such a costly roof to stand under, and they cannot afford to stand a great while on such costly ground. The people who so quickly flock to the trolley are satisfied to get along without any "terminal" at all. But as long as the Reading's through trains are not inconvenienced by the suburban business, the officers of the company can afford to make a sharp fight for the Germantown business if they see fit, and the result will be instructive. We should hope, however, that they would use $3,000 passenger cars instead of those costing $5,000, if they have any of the cheaper ones.

This new kind of competition that the old railroads have to meet has one characteristic that is very familiar to every railroad officer who has been engaged in many rate wars, and that is the fact that the aggressive competitors pay very little regard to the true cost of performing the service. Electric roads with new tracks and equipment can get along for a while with very small expenditures for repairs, and it appears that in a good many cases the managers base their calculations on the false assumption that the present low percentage of operating expenses can be permanently maintained. They know it is false, but that makes no difference. Again, the favorable attitude of the public may not last, and taxes may be imposed where now everything is free; but that does not worry the man who is industriously engaged in making hay while the sun shines. On the other hand, a street road so located as to do a large short-trip business can afford to carry passengers from village to village very cheaply, and before long the steam roads may in some cases have to meet three-cent fares instead of five-cent.

In Connecticut last week the legislative hearing brought out the fact that the New York, New Haven & Hartford had lost, during the last three months, between Norwalk and Rowayton 50 per cent. of the regular traffic; between Bridgeport and Southport. 80 per cent.; New Haven and Woodmont, 50 per cent.; New Haven and West Haven, 70 per cent.; Wallingford and Meriden, 30 per cent.; New Haven and Yalesville, 45 per cent.; Meriden and Yalesville, 90 per cent.; Southington and Plantsville, 100 per cent.; and Waterbury and Naugatuck, 95 per cent. Between Naugatuck and Waterbury (five miles, with one intermediate station) the sale of tickets had fallen off 7,000 tickets a month.

These varying percentages represent the varying conditions, such as nearness of stations to centers of population, frequency of trains, etc. The total loss is not large as compared with the total earnings of the trains on which these passengers formerly rode, but the seriousness of the case to the New Haven road lies in the fact that this loss is all cream. Expenses are not reduced a single cent. The item in which the loss was 100 per cent. affords a good illustration. The distance is short, but the trains all run through from New Haven to Northampton, 77 miles. It will pay to run them without the Southington-Plantsville traffic, but the profit will be small. Probably the freight bears more than its share of the expense on this division already. The business taken away by the street line is a dead loss, because the New Haven road cannot get it back without putting on probably five or ten times as many trains between the two places as it now runs, which means putting on electric cars, for passengers paying five cents each would not pay the cost of running a full-fledged railroad train, even if there were ten times as many of them as there are. And, at best, a car running through the fields would be at a disadvantage as compared with one running in the streets, for the better speed and safety do not count for much with passengers on such a short trip.

Power and Efficiency of Locomotive Boilers.

In another column a correspondent asks about the arguments for and against large grates for locomotive boilers. To reply fully would take much space, as the theories offered do not harmonize, and in many cases differ from the facts.

Although the arguments about the best forms of fireboxes for boilers that are run with forced combustion conflict with each other and often are contrary to common sense, it is not to be understood that there is no groundwork of fact that is accepted by all who are fair-minded. With these facts well in mind, one will at least not be led into follies, and he may escape some mystification. About combustion there is no mystery. If coal is heated in contact with air there will be combustion, and when the heat is sufficient and the air supply is correct there will be perfect combustion. We know how much air it takes and how much heat is required, and, knowing this, it is one of the easiest of mechanical operations to get perfect combustion. If perfect combustion was the prime object of burning coal we could get perfection at once.

But we do not seek perfect combustion, or anything like it; perfect combustion is too expensive. The last few heat units cost more to save than they are worth. We do seek to get the *most* heat into the water in the boiler that can be got from a pound of coal under some given set of conditions; and generally it is found that these conditions are such that anything like perfect combustion is impossible. This is true of a locomotive firebox.

In a locomotive boiler the first restriction to perfect combustion is the necessity of providing an absorbing surface, and an absorbing substance (water) that will take up the heat. If the space and weight of a locomotive boiler could all be given to the furnace we could get better combustion than is obtained in any class of boiler to-day. But the space taken up by the heating surface and the water is so great that the furnace is cramped and reduced to the lowest possible limits—in fact, there is less room for combustion in a locomotive boiler, as these boilers are forced in this country, than is allowed for combustion in any form of boiler used, except those for fire-engines and torpedo boats, where power, and not economy, is the thing sought. In locomotives both great power and good economy are wanted, and that is where the "shoe pinches." We could easily get one, but to get both is impossible.

The best that can be done is to select, by trial, the boiler and furnace so that the best practical results are obtained. No amount of theory, unless guided by practical experience, will tell what to do to get the best locomotive boiler. There is, in fact, no such thing as a best locomotive boiler for all the different conditions. The best practical boiler for a road where the fuel is cheap and good is the one that will give the most power without regard to the efficiency, unless the efficiency is so low that the boiler has to be forced so that the sheets are damaged and the repairs are too much increased. Where fuel is very cheap, power is the thing most wanted, and that boiler which will give the most power for the hauling of trains will be the most successful. The limit to the reduction of efficiency in the search for power alone is found in the loss of power which follows when the efficiency is very low.

When coal is high in price the need comes of an economical boiler, and the power must be reduced, or the cost of hauling a ton one mile will be higher. For this reason the train load is made less and the boiler is forced less, and is more economical. In this country we have cases of both kinds. Coal varies in price from 80 cents to $20 a ton. The boiler that is fitted for the use of the $20 coal is just as serviceable for the 80-cent coal, so far as the efficiency of the boiler alone is concerned. But when the whole cost of transportation is taken into account, it is found that the final cost per ton mile is less when the engine hauls the largest train, and therefore the most powerful boiler is the one that it is best to use. It is for these reasons that it is necessary to know the conditions of operation before the best boiler can be selected.

All know how to get the most economical boiler and how to get the most powerful boiler. But we may state the difference in a general way. The most powerful boiler is had when the grate is as large as possible and the crown sheet is not too far from the fire, and the tubes are about 10 or 11 ft. long and large in area of opening, so as not to impede too much the passage of the gases. A 2¼-in. or 3-in. tube will give more power than a 2-in. tube. The blast must be as strong as is possible to get it and not raise the back pressure in the cylinders too high, and there must be a variable exhaust so that the fire shall not be torn up at starting, otherwise the power will be lowered. Such boilers are used here, and they are capable of furnishing, regardless of economy, all the steam that can be used in a locomotive.

The most economical boiler must have just as large heating surface as possible, especially in the firebox, and the combustion must be slower, or there must be some better means than we now have for getting the air to the fuel. The mere passage of the air through the fuel is not an adequate mixing when the rate of combustion is high and good efficiency is wanted. This is the reason, above all others, why forcing a boiler reduces the efficiency, and it is the reason why a small grate, which has to be forced, will not give the same efficiency as a large one on which the coal can burn slower and the air have a better chance to mix with the fuel. A strong blast prevents good combustion. In the most economical boiler the tubes should be small and long. Probably a 15-ft. tube, 1½ in. in diameter, is about the best for this class of boiler. The power is much reduced, as the friction of the gases through the tubes is greater, and in some cases the grate should be smaller so there will be no waste of heat when the work is light.

Now we may state the fundamental differences in the designs of the most powerful and the most economical locomotive boilers.

It is seen that both must have all the firebox heating surface possible, and as much tube heating surface as can be obtained without interfering with the draft; therefore, in actual construction, the only differences of real importance are in the tubes and the size of the fire part of the grate. One fundamental design will answer for both by getting as large a firebox and as large a shell as the total weight will permit, and then, perhaps, block off the grate in the most economical boiler, and use the whole of it in the most powerful boiler. One must use a large number of small tubes of considerable length in the most economical boiler, and in the most powerful boiler use large tubes and shorten them at the back end, as this increases the firebox heating surface and the draft. In both, the firebox and the shell must be as large as possible.

These conclusions are founded on theories of combustion that we know all about. No locomotive boiler is too large for economy. It is easy to get either the most economical or the most powerful boiler, but to get the design that will give the particular combination of efficiency and capacity that will be the most suitable for a given road is a different matter, and the selection can only be made by trial. What we have to start with is the largest shell with the largest firebox that can be put on the engine, and not exceed the limit of weight, and then the interior must be changed to get the best results.

The question of firing the grate has no bearing upon the area of it, but only on the way that the area shall be disposed. When the length becomes too great for the fireman to reach the front end of the box the area can be extended sidewise. This has been done with such success that the practicability of it is proved. Only those will deny this to be a fact who have not had experience with wide grates. If those who have improved the ocean steamers, so that the capacity of the boilers and their efficiency is greater than ever before, even with the forced draft now common, had been so fearful of abnormal dimensions of boilers in cramped places as some railroad men are, we should not now be able to travel across the Atlantic in about five days. There seems to be a certain lack of courage to design larger boilers and of firmness and decision in dealing with frills and devices that are wrongly supposed to increase the power of small boilers. When there is more originality in thought and more boldness in design we shall hear less about delayed trains on account of lack of steam. There are roads that most of us know about on which the schedule time of the

most important trains is dependent upon the best efforts of the fireman and whenever there is the least unusual service the superintendent must choose between a double-header and a loss of time. It may be a severe criticism to say that this is an unnecessary condition, but the truth hurts no one in the end. If it be not the truth then the discussion now in progress at the Railroad Clubs will bring out the fact.

As to the theory of combustion that our correspondent enquires about: The gases from the fuel and the air coming through the grates, go along in streams and mix imperfectly, and therefore much more than the net amount of air to burn the fuel has to be let in to get reasonably good combustion. The net amount of air is about 12 lbs. per pound of fuel, while it is common to use, on the most efficient boilers, as much as 24 lbs. In Figs. 1, 2 and 3 the dotted lines show the air, and the full lines the gases.

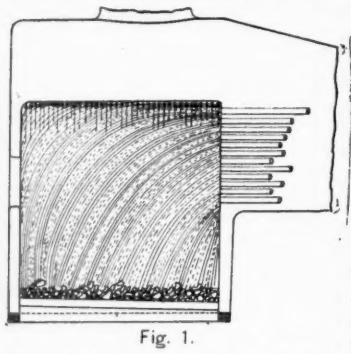


Fig. 1.

Fig. 2 shows how the heat is radiated to the crown sheet and to the sides of the fireboxfrom the incandescent fuel. The intensity of the heat that is radiated varies with the square of the distance from the fire. All other things being equal, the intensity is four times as much at 1 ft. as at 2 ft. That is—it decreases as the square of the distance from the fire increases. If the absorption of the heat in a boiler was dependent solely upon the taking up of the heat that is radiated from the fire, it would be best to put the fire as near the crown sheet as possible, and in some cases this is actually necessary to get the greatest boiler power—as in the case of anthracite coal, for instance. The absorption of the heat from the hot gases is an equally important factor, as the gases are hotter with some kinds of fuel than with others, and therefore the heating surfaces are differently disposed with respect to the fire. In some cases the heating surfaces are close to the fire, and in other cases the surfaces are shielded from the direct heat by brick arches.

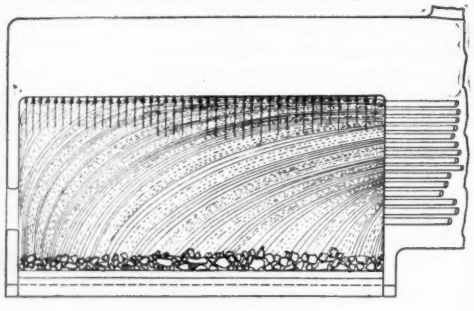


Fig. 2.

One of the limits to the depth of the firebox and to the length of the brick arch is found in the shutting off of the radiation of the heat from the fire direct to the crown sheet. See Fig. 3. With soft coal and a deep firebox there is a cloud of smoke and gas over the fire, and this cuts off the radiation to the crown sheet. Clear air does not absorb heat to any great extent, but gases of the kind that are over soft coal fuels when burning will absorb much of the heat from the fire, and for this reason there is a limit to the thickness of the vapor that should be permitted above the fire when it is desired that a boiler shall have the maximum capacity to generate steam.

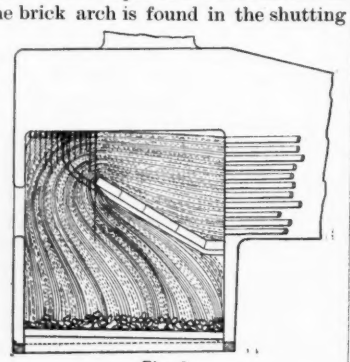


Fig. 3.

The desirable action of the brick arch is the heating of the gases as they come from the fuel; also it makes a longer flame-way and gives the gas a chance to burn before it is extinguished by the tubes. The undesirable action of thearch is that it shields the firebox from the fire and reduces the amount of the heat that is absorbed by radiation. In other words, it makes the gases hotter and necessitates that more heat shall be absorbed by the tubes in contact with the hot gases. If it were not for this fact, the brick arch would give more saving than it does on locomotives.

To make a hot chamber for the gases to burn in, the sides of the firebox have been lined with fire brick, but the result was a very hot smoke-box and a loss of efficiency, because the firebox sheets were shielded from the fire and the tubes could not take up the heat.

Perhaps the most important experiment that has been made to show the value of placing the grate not too far from the fire, is the one that was made by the Schenectady Locomotive Works. The engine was in hard service and there was not as much steam as was needed to make schedule time. The grates were raised one foot and the steaming power was increased. To make sure that there was no mistake, the grates were again lowered and the power of the boiler was reduced. This theory of the action of the deep leg boiler in reducing the power, while it may add to the efficiency of a boiler that is not very hard pushed, is an old one, but there is little accurate data in print to support it.

It is well known that deep leg boilers with anthracite and short flame coals, where the firebox must do most of the steam-making, are not so powerful as those where the crown is down close to the fire, although the economy when the boiler is not forced may be greater with the deep leg. It would not be necessary to consider all these factors of combustion were it not that the most economical boiler is not the most practical. The old question of power versus efficiency confronts one in selecting a boiler design.

It is well understood that smoke consumers are often coal wasters. Perfect combustion always costs more than it comes to, and when power and intensity of heat is the all-important matter, as in the case of locomotives and heating furnaces, one can only completely stop the smoke by permitting losses in the costs of operation. This is true of all kinds of plants where the furnaces must be forced to get power. It will be found that when the furnaces are not forced the smoke can be reduced, but not removed, without reducing the efficiency, and this is the case with heating plants and power stations where the boiler capacity is sufficient to give the necessary steam without forcing. When gross power is of itself the desired end, a smoke consumer may be found a detriment; but when efficiency is desired at the expense of gross power, a smoke preventer will generally increase the economy of the plant.

Bills concerning railroads in the various state legislatures during the past few weeks have been of interest more as regards their number than in the matter of kind or quality. Fewer new bills have been introduced than in January and February, and those bills which have appeared have been of the same character, in nearly every instance, as those noted in the *Railroad Gazette* of Jan. 18, Feb. 1 and Feb 15, so that a list of them would be of little interest. In Alabama, Idaho, Indiana, Kansas, Missouri, Montana, North Carolina, Oklahoma, Oregon, South Dakota and West Virginia the legislatures have adjourned and we shall soon have the official report of the bills they have passed. These reports will show very few railroad laws. Alabama has passed a bill making train robbery punishable by death and Wisconsin has one intended to prohibit blacklisting, but these are the only laws of general interest whose actual passage we have thus far noted. The Arkansas bill to establish a railroad commission was killed, and the Helm bill in the state of Washington, intended to regulate railroads in a sweeping manner, was also lost. There was an unsuccessful move in the Kansas legislature to give the state railroad commissioners power to enforce their rulings.

Among the bills which are still pending, and in which there is some interest, is one in the New York legislature to give the city of Yonkers, 16 miles north of the New York city hall, additional facilities for rapid transit to and from New York. This bill affords an excellent example of the way in which our law makers like to "regulate" railroads by prescribing methods of dealing with minute details. It says:

That between the hours of 7 and 9 a. m. daily, except Sundays and legal holidays, but including Saturdays, the New York Central & Hudson River Railroad Company and the Manhattan Railway Company shall, at such reasonable intervals within said hours as the management of the respective companies may agree upon, run and operate not less than three solid passenger trains, composed of not less than four passenger cars to each train, from Getty square, in the city of Yonkers, N. Y., via 155th street and the Ninth avenue line of the Manhattan Railway Company, to Rector street, in the city of New York, and starting from Rector street, between the hours of 4 and 6 p. m., daily, as aforesaid, at like reasonable intervals within such hours, the railroad companies shall run and operate not less than three solid passenger trains from Rector street, upon and over the route stated. Such trains shall be what are commonly called express trains, and the schedule time between the termini shall not exceed 50 minutes. The bill also provides that the weight of the cars and engines of these trains shall not exceed the weight of the present standard coaches and engines of the Manhattan Railway Company, and that the cars shall have adjustable platforms, suitable for raised stations on the elevated structure, and be convertible into the ordinary car platform and steps when not on the elevated structure. The bill also stipulates that, after the act becomes operative, if the railroad companies fail or refuse to operate these trains, they shall be liable to a fine of $50, payable to each passenger affected, as liquidated damages recoverable in any court of competent jurisdiction in the State.

When the Legislature of New York has to devote its time to the consideration of laws prescribing the weights of new cars which a railroad must build for carrying passengers at six mills a mile, one naturally asks what use there is for three State Railroad Commissioners at $8,000 a year each.

The first appearance of Mr. George H. Daniels in anything like an ecclesiastical role was, if we remember correctly, as a singer in a church choir out West several years ago; but it was not his last, for we find him now appearing as a full-fledged dispenser of the gospel, although not in the sanctuary. On the contrary, his listeners were railroad men, who more often dispense *with* the gospel. We refer, of course, to the address delivered at the meeting of the General Passenger Agents' Association in New York last week where, as we see by the artistic brochure sent out in blue ribbons, Mr. Daniels took for his text an extract of some 200 words from the prophecy of Ezekiel. Impressed, no doubt, by the cosmopolitan character of his audience, Brother Daniels endeavored faithfully to make applications which should appear to everyone as broad and general; but we are bound to say that we think the image of the Empire State express, the beautiful landscapes in which the most prominent objects are four parallel railroad tracks, and other scenes familiar to readers of New York Central literature, were not for a moment absent from his mind. We do not say this in any derogatory sense, but rather as a compliment. The true G. P. A. glorifies his own road not only during his waking hours, but while he is asleep, as well, and the interpretation of this scripture, representing "a great cloud with a fire infolding itself" (which means the engine of the Empire State express on a frosty morning when she is burning 50 lbs. of coal a minute), and the "living creatures with four faces," mixed up with wheels, etc. (which, if it means anything, must mean four trains abreast on the New York Central), was entirely involuntary, or at least wholly devoid of malice, we are quite sure. We have not the space to follow the eloquent speaker through all his startling periods, but we feel like warning President Depew to look sharp to his laurels, for the references to Florentine history and other ancient lore indicate that the President's office is not the only place on the New York Central where there is an efficient literary bureau. The Young Men's Christian Association orators of the New York Central must also look out, for Prof. Henry Drummond seems to be as familiar an acquaintance in the G. P. A.'s office as the New York reporters; while the references to what was going on in various parts of the world 3,000 years ago should be a hint to Mr. Kirkman that he no longer has the whole historical field to himself.

The Railroad Commissioners of Massachusetts have "recommended" the Merchants' Co-operative Express Co., of Lawrence, as a suitable organization to carry on the express business between Boston and Lawrence in the cars of the Boston & Maine Railroad. A law was passed in 1894 intended to favor the establishment of local concerns like this to compete with the large express companies, and the Commissioners held an inquiry under this law. Applications similar to this from Lowell and Reading were turned away with unfavorable answers. The Lawrence company made out its case by bringing testimony to the effect that since the American company bought out some small rivals it had not given so good service as before, and the American brought no citizen of Lawrence, outside of the express office, to contradict this testimony. It appears that after the American company absorbed the small companies it "did not take the people into its confidence, but kept up the semblance, under various names, of two or more independent and competing companies," all of which were in reality controlled by itself.

We have before this mentioned the fact that Mr. E. W. McKenna, General Superintendent Eastern Division Great Northern Railway, has taken out patents for a process of re-rolling rails. His claims are, heating the old steel rails to a temperature "just below that at which the carbon would be materially affected," straightening them and reducing the cross section proportionately in all dimensions except in height, but retaining the original height. Thus it is expected to remove irregularities due to wear or other cause, and turn out a rail with reduced cross section properly proportioned, but which can still be used with the standard rail of the track from which the old rails were taken. The Pioneer Rail Renewing Co. has been incorporated and has recently been organized, with headquarters in Chicago. Negotiations are pending for a lease of the North Chicago Mill of the Illinois Steel Co., where the experiment of re-rolling rails will be tried. Several railroad companies have promised sample orders; and from the standing of the men in control we are safe in saying that the enterprise is serious and worth watching. The company expects to be ready for work by May 1.

The *Chronicle* printed last week its returns of net earnings for the month of January. One hundred and thirty-eight roads showed in the month a gain of 1.87 per cent. In gross earnings, a decrease of 0.55 per cent. in operating

expenses and a gain of 9.04 in net earnings, excepting last August. This is the first time in 19 months when the roads have shown a gain in both gross and net. The gain in gross is so small that it could be easily turned to the other side by the presence or absence of the reports of a few roads, and in fact the *Chronicle's* earlier report of gross earnings for January did show a small loss. Although the gain is so small it is considered decidedly encouraging as "indicating a turn in the tide." As a matter of fact, however, we have seen several turns in the tide in the last two years, and no one will be very confident that this turn is permanent until the tide has gone on rising for some months.

NEW PUBLICATIONS.

The St. Louis Union Station is the title of a beautiful monograph which has just been issued, giving a full and lucid description of the structure named, which, as our readers will remember, was completed and put in use last autumn. This work, of nearly 100 pages about 10 × 13 in., is the joint production of the architect, Mr. Theodore C. Link, and officers of the Terminal Railroad Association, which is the owner of the building. The introduction to the book is by Dr. William Taussig, President of the Association. The artistic feature of this book is a series of 25 "chemigraph" plates, mostly full page, from photographs, showing interior and other views of the elaborate decorations and magnificent architectural features of the building. The text includes, besides a description of the head-house and train-shed, an account of the power plant, auxiliary buildings and signal interlocking system. In addition to the full page cuts there are numerous illustrations in the text. The chapter on the train-shed, speaking of it as the largest structure of the kind in existence, is accompanied by the table printed below, showing the dimensions of this and other large train-sheds. The book is issued for private circulation and the number of copies is limited.

This station and the improvements connected with it, which have cost about six and a half million dollars, have been described in the *Railroad Gazette*, chiefly in the issues of July 24, 1891, and Aug. 24, 1894.

DIMENSIONS OF LARGE TRAIN-SHEDS.

	Length. ft.	Breadth, ft.	Area, sq. ft.	Tracks.	Companies.
Union Station, St, Louis	760	606	424,2 0	31	22
Boston & Maine, Boston.	536	460*	246,560	23	3
St. Pancras, London.	700	24	168,000	....	....
Frankfort on the Main	600	552*	331,200	18	4
Broad Street, Philadelphia	592	704	170,086	16	1
Phil. & Reading, Philadelphia	800	240	208,000	11	....
Dearborn Street, Chicago	590	169	99,710	10	6
Grand Central, New York	620	332*	205,840	51	3
Cologne, Germany	765	276	211,000	10	4

* These, like St. Louis, have each two or more spans.—EDITOR RAILROAD GAZETTE.

Cast Iron Chilled Car Wheels.—Mode of manufacture and relations they bear to economy in railway practice. By William W. Lobdell, Secretary Association of Manufacturers of Chilled Car Wheels, Wilmington, Del.; 1895.

The Association of Manufacturers of Chilled Car Wheels, at its last annual meeting, requested its secretary to prepare a short paper on chilled car wheels for distribution to the railroad officers of the United States and Canada. The pamphlet now before us is the result. Mr. Lobdell begins with a reference to the history of the cast-iron chilled wheel, saying, among other things, that there is no other article so universally used on railroads on which so much depends, that can be produced as cheaply and quickly, and which, when worn out, represents as large a per cent. of its first cost; which seems to us quite true. Furthermore, we think there can be little doubt that the introduction of the chilled car wheel has had a good deal to do with the rapidity of the extension of the railroad system in our country. It is doubtless quite within reason to say that the railroad investment in the United States at this moment would be increased somewhere from $30,000,000 to $35,000,000 if steel-tired wheels were used instead of cast-iron wheels.

Mr. Lobdell gives a little description of what chilling is, of what it does and how it is done, and of the reason for and process of annealing. He says that the limit of strength of cast iron wheels has not yet been reached, and it is not likely that it will be passed until the speed and weight of equipment is increased beyond anything now contemplated. As to wearing qualities, if a proper iron mixture is used, chilled iron is harder than any steel that can safely be used in a tire. Numerous instances are known where chilled wheels have given a mileage of over 200,000, and in some cases 300,000 miles. Such results cannot, of course, be produced with inferior irons or at present prices, but if the application of the brake could be more carefully regulated the life and safety of a wheel would be increased 100 per cent. This follows from the injury done to the wheel by long continued application of the brake and from sliding.

The pamphlet concludes with the story of the organization of the Association of Manufacturers of Chilled Car Wheels, of their conferences with the committees of the Master Mechanics' and Master Car Builders' Associations and of the adoption of specifications and guarantee and method of computing cost of wheel service. All of this is doubtless familiar matter to most of our readers. Those, however, who are not informed as to this important part of the chilled car wheel history and as to the present status of the makers and users should procure this pamphlet.

English Railroad Practice.

Mr. Delano's excellent paper on English Railroad Practice, read before the Western Railway Club at its January meeting, was discussed at the February meeting. The paper dealt with a great number of topics and in considerable detail, and similarly the discussion ranged over pretty much the whole field of railroading. Therefore both paper and discussion are difficult to treat by abstract and we can only recommend the reader to get them in full from the Club. One railroad president has sent us a copy of a letter, recently addressed by him to Mr. Delano containing some suggestions, and as these will not appear in the recorded discussion before the Club, we mention a few of the points that he brings out.

"One matter is that of cab fittings. Can anything be more awkward or ill-adapted to quickness of manipulation than the fittings of some of our modern engines. The engineer is cramped, unable to use his hands and feet with the ease and freedom that he should. He is in a strained position, which leads him to be less alert during long runs. The intervention of the boiler between the fireman and engineer, and the obstruction of observation of one another, has led to accidents, and will lead no doubt to more serious ones, until we understand that this practice must be abolished. I believe that in our express runs a standing position would be better adapted to the work of the engineer. I would like to see the experience tried of adapting the engineers' side of the cab in some express engine for an option at least of a standing position for the run.

"It is interesting to observe how as conditions here approach those in England there is a tendency to the same methods. For instance, on all the great systems of England the traffic is dense; it is simply a question of being more dense on some portions of the lines than others. In very few instances in this country have we the density of traffic and the conditions attending it, that is found there. Are we not coming to adopt their methods, where this is the case? For instance, in the passenger traffic, where it is the densest, we have adopted the high platform, and where a very heavy traffic could be foretold at the inception of lines adapted to the work, we even went so far as to have side entrances to our cars, noticeably on the Illinois Central World's Fair lines. We are endeavoring on many lines to avoid stops at crossings and bridges, and when we do, we may come to the single driver engine and the sand-blast; at any rate, we shall be using much larger wheels than are now in practice. In the work in our crowded terminal stations, we are approaching the time when it will be necessary to adopt the English method of the transfer turn-table, and the hydraulic capstan, or some modification of it. It seems to me that if a station were properly designed at the beginning, we might use transfer tables instead of turntables."

"On the other hand, it is noticeable where the conditions of continental service resemble ours, that they are availing themselves each year to an increasing extent of our methods. The dining car and corridor train are but counterparts to our American trains. I might enlarge upon this, but this serves to illustrate my point that conditions are the incentives of variation of practice.

"I desire to say a few words on the fact, as stated by you, that the managing of English railroads had largely been in the hands of Engineers; while our heads, have generally been men of other training. Many an American railroad has, and is still forced to manage its affairs so as to scrape together enough to meet its obligations at January 1st. We have not yet been able to make improvements which will pay for themselves in five years, but alone those which will pay for themselves in one. The light traffic of the early lines of this country, commanded men to practice the greatest economy. The necessities of what might be termed a knowledge of railroad matters was second to that of being a man of common sense and business ability. Then, of recent years, we have had the necessity of having men who were able to be of influence in a political way. This necessity is apparently growing no less, and these two conditions, to my mind, are the reasons that none of the great systems of the West have as their chief officer a man of technical education. On the Eastern lines, where the conditions again are approaching those existing in England, we are beginning to find a man of technical education at the wheel. I know of one far Western system to-day exceeding 1,000 miles in length, where the President is a man who, on a recent occasion, when a switch engine endeavored to couple its brake hose to the signal hose of his car, stood beside the men for some moments wondering why his Master Mechanic had put two hose on his car, and why he had not put them on so that they would fit, and that man is able to-day to handle the Legislature of the State in which his road is, and is able to make himself felt at Washington, so that he is of greater necessity and value than any other man connected with this property."

Foreign Railroad Notes.

The Austrian State Railroad authorities have announced that on July 1 next about 6,000 workmen employed on the lines by the day or week, liable to dismissal when not wanted, will be taken into the ranks of regular employees, with stated yearly wages not less than the pay they have hitherto received, with right to gradual advancement, uniforms pensions after retirement, and the other privileges which make the corps of regular employees in some respects like our army officers—the chief advantage of all being that the employee cannot be discharged without gross fault on his part. The President of the Austrian State Railroad Directory, in announcing the change, says that thereby the men receive a notable advancement in their whole social position and secure provision for old age and illness.

Probably about one-half of the railroad men in the principal countries of continental Europe belong to the class of regular employees. The men who will be taken into this class in Austria are chiefly mechanics in the shops and round-houses, foremen in store-houses, clerks who make out way-bills, switchmen, car-cleaners, lampmen, and laborers permanently employed where supplies are kept.

The railroad authorities of Wurtemberg, Bavaria, Baden and Hesse (whose railroads are nearly all State railroads), have made an agreement concerning the suspension of freight traffic on Sunday, according to which freight traffic, with the exception of fast freight, live stock, and carload shipments of beer and fresh meat, will be suspended completely on Sundays and other holidays, beginning with next May. Trainmen, so far as possible, are to be left at home as early as 4 a. m. on these days, and not called out again before 6 p. m. In the time of heaviest traffic—say from the middle of September to the end of November—these regulations concerning Sunday rest may be relaxed or suspended altogether, as otherwise it is thought there would not be cars enough to handle the traffic.

The Russian State Railroads are about to establish central offices in St. Petersburg and Warsaw, where tickets will be sold over all routes, orders taken for carrying baggage to and from stations, for packing goods, collecting, delivering and insuring freight, and performing the duties of a custom-house broker. Heretofore all such business, when done at all by the railroads, had to be transacted at the stations.

TECHNICAL.

Manufacturing and Business.

The New York & Missouri River Railway Co. has been organized in New York City to secure the enlistment of capital in railroad building, and conducting negotiations between capitalists, engineers and railroad directors. The capital is $1,000, and the directors are Theodore W. Osborn, Dwight L. Hubbard, and John Ford.

Six carloads of engines and boilers were recently shipped to Mexico by Chandler & Taylor, of Indianapolis, Ind.

The Penn Iron Works, of Lancaster, Pa., resumed operations on March 11.

William Sellers & Co., of Philadelphia, are constructing 10 electric traveling cranes for the Bethlehem Iron Co. These cranes range in capacity from 5 to 75 tons. In addition three 10-ton electric traveling cranes are being built fo the Westinghouse Electric & Manufacturing Co., of Pittsburgh.

During the present month, the Rice & Sargent Engine Co., of Providence, has received three orders for steam engines. One is a tandem-compound of 300 H. P. with cylinders 14 and 26 in. and a 42-in. stroke, independent condenser, to run at 100 revolutions a minute in the Pembroke Mills, Suncook, N. H. The Lawrence (Mass.) Lumber Co. has ordered a 200 H. P. engine, 20 × 42, 80 revolutions, and the Oakdale Manufacturing Co., of Providence, a 75 H. P. engine, 12 × 30, 110 revolutions.

The Forest City Car & Manufacturing Co., with a capital of $20,000, filed a charter at Harrisburg, Pa., last week.

A meeting of the stockholders of the O'Neil Highway Crossing Alarm Co. was held March 22 at the Rookery Building, Chicago, and the following Directors were elected for the ensuing year: W. P. Johnson and W. D. Drake, Cleveland; Shirley P. Austin and A. L. Dunbar, Meadville, Pa., and J. T. Gardner, Chicago.

The recent annual report of the Union Switch & Signal Co., as given in the newspapers, reported gross earnings as $402,412 and the net was given as $29,229, against $197,909 in the preceding year. Dividends calling for $23,796 were paid out during the year, leaving a small surplus for the year, the total surplus on Dec. 31, 1894, being given as $427,044.

The Canadian Engine & Locomotive Works, at Kingston, Ont., is going into the manufacture of gas engines.

Mills & Goddard, architects, Columbus, O., have prepared plans for a large plant for the A. K. Rarig Manufacturing Company at Rarig Station, a northern suburb of Columbus. The main building will be 632 × 126 ft., and the pattern building 250 × 50 ft. The company will put in an electric lighting plant in connection with that for power. The works will be used for manufacturing engines, boilers and rolling mill machinery.

The New York & New Jersey Granite & Paving Co., Postal Telegraph Building, New York City, which was organized under the laws of New Jersey in December, 1894, is now erecting at its quarries in Pompton, N. J., a complete plant, including four crushers of a capacity of 450 tons per day, built by Earle C. Bacon, of the Farrel Foundry Co., Ansonia, Conn. Two asphalt plants are also being built by E. N. Gray, of Washington, D. C., in Jersey City and Brooklyn, and a refining plant is being

rapidly pushed to completion in Hoboken. The quarry of this company consists of about 110 acres of high-class granite. The principal business of the company will be to furnish dimension stone to railroad contractors and builders, together with crushed stone of various sizes. The officers of the company are: President, L. H. Doremus; Secretary and Treasurer, James Langan, and General Manager, James Jackson. Colonel Robert Alexander is General Superintendent, and will have charge of the asphalt department of the company.

Iron and Steel.

The Toledo Rolling Mill Co., of Toledo, was incorporated last week by A. W. Houston, J. W. L. Adams, N. H. Sherman, W. F. Duhlmeier and Nelson Taylor. The capital stock is $50,000.

The Missouri, Kansas & Texas has recently given a contract to the Illinois Steel Co. for 3,300 tons of 66-lb. rails.

New Stations and Shops.

The plans for the new stations to be built by the Missouri, Kansas & Texas at Sedalia, Mo., and Parsons, Kan., are now well under way. The Parsons structure is to cost $50,000, and that at Sedalia, Mo., will cost about $30,000. The bids for erecting both these buildings will be called for immediately by the Chief Engineer, Mr. Cary A. Wilson.

The Berlin Iron Bridge Co. is building a large warehouse in New York City for James Everard. The building will be 120 ft. square, 12 stories high, with a steel frame, and will be entirely fireproof. The Metropolitan Electric Co., of Reading, Pa., has placed the contract for a new power house with the company.

The Seaboard Air Line will erect a large passenger station at Charlotte, N. C., it being the intention to begin work on the building during the spring. The erection of the structure will be in charge of Capt. T. W. Whisnant, Superintendent, at Atlanta, Ga.

The officers of the Pennsylvania, Big Four and other roads entering Columbus, O., have agreed upon plans for the proposed union station at that point. It has been decided that the structure will be 850 ft. long and will be built west of the present building, which will be used for a trainshed.

The Wabash is to rebuild its roundhouse near Toledo, which was destroyed by fire a short time ago. The new roundhouse will be built of steel and made fireproof, and will have stalls for 12 engines.

Two new buildings will be commenced in a few days for the Wilmot & Hobbs Rolling Mills, at Bridgeport, Conn. They will be 150 ft. × 200 ft., and 80 ft. × 85 ft., respectively, and will be fireproof.

The Swinerton Driving Wheel.

It is a good while since we have heard anything of the Swinerton driving wheel, but the reader will doubtless remember it as a wheel, the tread of which is a polygon instead of a circle, there being numerous small plane surfaces on the tread. A locomotive with a single pair of drivers was built and fitted with Swinerton tires and run for a while on the Boston & Maine Railroad, and the record showed good results. This was in 1889, we believe The same locomotive was run for a time in 1890 on the Central of New Jersey. What has become of it now we do not know, but the idea has not been sleeping. It appears that something like a year ago the Newton Street Railway Co., of West Newton, Mass., began an experiment with this style of wheel on one of its electric motor cars. The result was so satisfactory that the company has decided to equip all its cars with the Swinerton driver as fast as the old wheels wear out. These wheels are, we understand, of cast iron, cast by the Whitney Company, in a contracting chill, one advantage of which is that by the proper construction of the chilling segments the faces are formed on the chilled surface without any subsequent work. The Newton Street Railway Co. has found that the wheel has better adhesion and consequently will not slip where round wheels do. It has been run through all seasons of the year, on all sorts of rail, through wet, mud and ice, and the slipping is found to have been much less than with the circular tread. The experience on this same electric road appears to show also that it takes less power to run a car equipped with these wheels than with the ordinary wheel, and it is believed that the Swinerton wheel will have a longer life than the round wheel. We have no figures as to these various facts, but this is the judgment of the Superintendent of the company.

The Pittsburgh & Lake Erie Canal.

Although the subject of a ship canal between Pittsburgh and Cleveland is being pushed with vigor by the manufacturing interests of Pittsburgh, the manufacturers of Cleveland are not enthusiastic over the scheme, and after most careful investigation the special committee of the Chamber of Commerce appointed to make an inquiry into the matter has refused to approve the project. The report did not strongly condemn the plan, but did not consider it as of particular value to the city.

The most favorable route for the canal would make it 130 miles long with 759 ft. of lockage. At the rate of cost of the locks on the Sault Ste. Marie the 35 locks required would cost $28,000,000, which is more than the Pittsburgh promoters of the plan expect to pay for the whole canal. The committee concluded that $50,000,000 is the least sum for which the canal could possibly be built with the dimensions proposed. The strongest objection to the plan is the time that would be consumed in lockage. It was estimated that for 35 locks this time would be so great as to make such a means of transportation of doubtful utility.

The committee was made up of men thoroughly familiar with all the conditions of lake navigation, and their unfavorable decision gives the project another discouragement.

Feed-Water Heaters.

In our last issue, page 187, appeared a short article concerning the rating of feed-water heaters. In that the Keystone Engine & Machine Works were given as makers of the Kensington feed-water heaters. Kensington should have read Keystone.

The Paris Metropolitan Railroad.

The French Minister of Public Works has decided to withdraw absolutely the bill for the construction of the Metropolitan Railroad in Paris. The municipal assembly voted by a majority of one to submit the matter to a popular vote, which should decide whether the project should be conceded to the city or to the great railroad companies. This plan was annulled by the Government, and the action of the Ministry has been taken because of the evident prejudice of the Municipal Council. The question has been for 20 years, off and on, before the governing body of the city and has always met an unfavorable reception. The failure of the project now is especially regretted in Paris, in view of the need which will be felt at the time of the World's Fair in the year 1900 for better means of interior transportation.

Electric Consolidation.

Rumors have been flying about the newspaper offices and the markets for the last two or three weeks of a consolidation of interests of the General Electric and the Westinghouse companies, the visible effect of which is an advance in the shares of both companies. So far no responsible person has been able to say that he has secured definite information from the officers of either of these companies as to the truth of these rumors, but it is pretty certain that negotiations for an agreement have been going on, and it seems very probable that some kind of an agreement has been arrived at. It is decidedly for the interest of the shareholders of these companies and of the public at large that a good working agreement should be arrived at.

THE SCRAP HEAP.

Notes.

A roundhouse of the Central Railroad of Georgia, at Augusta, was blown down by a tornado on March 20. The paint shop was also damaged.

The Chief Engineer of Canadian Government railways estimates the loss to the Government through the recent destruction by fire of the Intercolonial Railway wharf and elevator at Halifax, at $250,000.

At Altoona, Pa., last week, 18 employees of the Pennsylvania Railroad were brought before the local court on a charge of violating the Sunday laws. Twenty-one cigar dealers were arraigned at the same time.

The Pennsylvania Railroad is to fit up a large restaurant in the sixth floor of its Broad street station at Philadelphia. The offices of the company are now in this building, and nearly 1,500 employees work in it.

A train of the Florence & Cripple Creek Railroad was stopped by robbers near Victor, Col., on the night of March 23d. Nothing of value was found in the express car, but some of the passengers' valuables were taken.

The Canadian Pacific has made a general reduction in wages: 5 per cent. on all under $2,000 a year, and 10 per cent. above that. The Long Island Railroad has reduced the wages of certain station agents and passenger brakemen.

It is reported from Montreal that very large fields of petroleum have been discovered about 70 miles north of Fort Saskatchewan in the Northwest Territory. The Dominion Government will probably assist in their development.

At Logansport, Ind., last week, a man was badly beaten by a number of railroad employees because he was suspected of being a detective, who has been going around the saloons with a kodak photographing railroad employees in the act of drinking.

The Western Publishing & Advertising Co., of Winnipeg, has leased from the Canadian Pacific Railway the advertising privileges of all its stations, offices, telegraph poles, fences and premises generally. This contract covers 7,000 miles of line and 1,100 stations.

Gen. E. S. Greeley, of the firm of the E. S. Greeley Company, of 5 Dey street, New York, has given to the Boardman Manual Training School, at New Haven, Conn., a set of electrical apparatus valued at $1,000. It consists of various galvanometers, batteries, rheostats, etc., to be used in the electrical course of that institution.

Among the laws passed by the North Carolina legislature, just adjourned, was one requiring railroads to redeem unused tickets. The usual details are specified, and this, with the law making it a misdemeanor for any person except the agents of railroad companies to deal in railroad tickets, ought to drive the scalpers out of business in that state.

The Postmaster of New York City has arranged with the cable railroads on Broadway and Third avenue to run mail cars for carrying letters between the main post office and sub-stations. This mail has for many years been carried on the Manhattan Elevated trains. At Philadelphia similar arrangements are being made with electric lines running to and from the post offices in the outskirts of the city.

A dispatch from San Francisco says that Mr. C. P. Huntington, President of the Southern Pacific Company, has been indicted by the United States Grand Jury for violating the Inter-State Commerce law in giving a pass. Frank Stone, who accepted a pass, furnished the evidence. This case has been under discussion for some time, and the Grand Jury, in finding the indictment, acted contrary to the advice of the United States District Attorney.

The Governor of New York has approved a bill for reimbursing Tioga County for expenses incurred during the strike on the Lehigh Valley Railroad in November, 1893, and in so doing filed a memorandum stating that, although a county is ordinarily bound to maintain the peace within its limits, this case was exceptional, because the rioters came from outside of the State; and it appeared that the county had already paid expenses aggregating a much larger sum than that provided for by the legislative bill.

A test has been made at Schenectady, N. Y., of the newly devised sliding shuttle which will be used in connection with the electrical locomotives for the Baltimore Belt Line tunnel. This shuttle, which replaces the trolley of ordinary electric lines, has been run through its trough at the rate of 25 miles an hour without heating. The first of these electrical locomotives will be delivered in Baltimore about May 1. It is anticipated that passenger trains will run through the Belt Line tunnel upon the inauguration of the summer time table.

Failure of the Launch of the "St. Paul."

The launch of the American line steamship, *St. Paul*, which was to have taken place March 23, was a failure, owing to the poor quality of the tallow used. This is the first time but one, that a vessel has failed to leave the ways since 1873, when the *Pennsylvania* had a similar experience. The *St. Paul* will probably be put into the water within the next two weeks.

Fifty Thousand Miles with One Packing.

The Union Grease Co., of Boston, Mass., was established in 1879, and organized last year with $300,000 capital. In the company's new catalogue is shown the record of an ordinary passenger car, running 50,000 miles in several months, with one packing of 40 lbs. of Union car-axle grease, without a hot-box. The company has lately moved into a new factory capable of producing several thousand tons per year, without employing direct heat. With its various grades of grease it offers to supply the largest trade for steam, electric and cable railroads, for ocean and inland steamers, and for all mills and factories using machinery.

Licensed Architects.

A bill has been introduced in the New York Legislature providing for the licensing of architects in New York State. It provides for a board of directors of the American Institute of Architects who are to appoint, with the approval of the Governor, an examining board of seven persons. This board shall hold examinations at least once a year in each of the judicial departments of the State. Any person over 21, by paying a fee of $5, will be examined, and if passed by a majority of the board will be allowed to practice upon payment of an additional fee of $15. The bill further provides that persons engaged in the practice of architecture at the time of the passage of the act shall be entitled to a license without fee or examination, but the board may revoke licenses at its discretion. The practice of the profession without a license will be punishable by a fine of not less than $50 or more than $500. Provision, however, is made whereby persons may design their own buildings or may be employed for such purpose provided their employer has full knowledge that they are not licensed architects.

The International Railroad Congress.

The list of American railroads which will take part in the International Railroad Congress, to be held in London next June, is still very short. We learn, however, that the Lehigh Valley has recently joined.

Logging Loads for Teams.

Those who have never seen logs hauled by team cannot realize the enormous quantity that one team will pull on the snow or ice logging roads of the Northwest. The hauling records are claimed to have been broken the past two weeks, and the records of some of the different hauls are given. With four horses 37,120 ft. of logs were hauled a distance of four miles, and this without assistance in starting the load. This is said to be the champion load of the woods, and was 20 ft. long, 18½ ft. wide on the runners, and 26 ft. high. This load weighed, probably, 40 or 50 tons. At another camp 12,000 ft. was hauled by two horses five miles.

Trent Valley Canal.

The Dominion government is now considering tenders received for the construction of 6½ miles of canal work on the Peterboro & Lakefield Division. There will be five locks 142 ft. in length. The approximate lifts for these locks will be as follows: No. 1, 16 ft.; No. 2, 10 ft.; Nos. 3 and 4, 12 ft., and No. 5, 14 ft. A high level bridge will be constructed at Lakefield with a clear span of 81 ft. Tenders for the balance of the work will shortly be called for.

Causes of Fires on Railroad Property.

Mr. Hugh B. Ely, Superintendent of the Insurance Department of the Pennsylvania Railroad, has issued the following "Analysis of the Causes of Fires," covering a period of nine years, 1886–1894, inclusive:

1. Inherent Causes, Avoidable—Consisting of such heads as from the construction, occupancy or character of risk are inherent or usual in its class, viz.: Defective flues, stoves and stove pipes, gasoline, heating arrangements in Eastman heater cars, lading of hot ashes and coke, over heated stoves, pipes, etc., sparks from locomotives, spontaneous combustion, live coals or cinders from locomotives. Total number of fires under this head, 603; amount of loss, $101,846.

2. Direct Cause, Generally Avoidable—Includes such hazards as are not necessarily incident to the risks, but generally found present, viz.: Carelessness of employees, electric light wires, lamps or torches, wrecks and collisions, overturned stoves, explosion of ladings and self-ignition of ladings. Total number of fires, 241; amount of loss, $337,535.

3. Remote Causes, Generally Unavoidable—Hazards not incident to risks and not usually under control of

our people, viz.: Adjacent burning property, fireworks, forest fires, lighted cigar or match dropped, lightning, matches ignited by rats, mice, etc. Total number of fires, 94; amount of loss, $90,309.

4. Lawlessness, Unavoidable—Such as riots, incendiarism, tramps, etc. Total number of fires, 40; amount of loss, $49,457.

5. Unknown—Many of which would come under the head of "Carelessness of Employees" if the proper cause were stated. Total number of fires, 177; amount of loss, $213,111.

Total, 1155 fires, $1,092,258. More than two-thirds of the number of fires and over half the losses come under the head of avoidable.

A Difficulty with Distant Signals.

The American Railway Association, being properly cautious, has never gone so far as to recommend the use of distant signals, except "where desired," or "where local conditions require." We have sometimes regarded this as extreme conservatism; but "local conditions" are subject to great variations, and here is an illustrative instance, which we find in a story from India:

"From the Station Master——to the Superintendent R. & K. Railway:

"SIR—I beg to bring to your kind notice that no sooner the watchman Dilsaak reached the distant signal than he saw a tiger coming toward him. He says the moment he was greatly alarmed, but fortunately the Almighty assisted him, and caused him to climb up the signal. The tiger was in thorough expectation of getting prey, and did not remove himself for about half an hour. When the train whistled he began to roar, and aroused at the distant signal he ran away. Up to this time Dilsaak was in the signal; he says he was seen by passengers and the driver in charge, toward whom he loudly cried with a view to make him slow. . . . Under the circumstances you will kindly put a stop of lighting the distant signal, otherwise one day a life of mankind would be victim to the wild animals."

The Exhibits at the Technical Conventions.

Arrangements have been made by the Standing Committee of the Supply Men's Association for an ample amount of space for firms wishing to make exhibits at Alexandria Bay during the June conventions of the Master Car Builders' and Master Mechanics' Associations.

Mr. Chas. W. Crossmon, proprietor of the Crossmon House, will give the use of the pavilion, a building 15 ft. wide and 60 ft. long with a veranda 9 ft. in width running entirely around it, in addition to which he will, if found neeessary, raise a large tent on the lawn. To insure prompt delivery, consignments should be marked Alexandria Bay, N. Y., via Clayton, care of the Crossmon House, where they will be received by a special committee stationed on the ground at least a week in advance of the Conventions, and transported from and to the wharf free of charge. For space or further information address W. C. Ford, Secretary, 29 Broadway, New York City, N. Y.

Lake Notes.

Major of Engineers C. B. Sears has submitted a plan for the improvement of Allouez Bay, a new part of the harbor at the head of Lake Superior. The plan calls for a channel 400 ft. wide, 5,280 ft. long and 20 ft. deep, and the material to be moved amounts to 1,525,000 cu. yds. In addition to this channel the engineer advises an anchorage basin about 1,500 × 1,800 ft. in size. This would double the quantity of material to be moved, and would make the total considerably over 3,000,000 yds. An alternative proportion has been worked out for earlier construction, that is half the width of the full channel and of 16 ft. depth. The Secretary of War has asked for these estimates, and it is practically assured that the next Congress will be asked to authorize the improvement, which will cost a very large sum.

On March 1 there were at the head of Lake Superior 630,000 tons of coal, 550,000 tons being bituminous. At the opening of lake navigation in 1894 there were 450,000 tons on dock, and it is not expected that the total next May will be any less than a year ago. Soon after the opening of navigation in 1894 came the coal strikes, which made head of Lake Superior docks the only source of supply for a vastly increased district, quickly cleaned up all stocks. At one time nine Chicago railroads were getting their coal from Duluth and Superior docks The receipts of coal for 1895 are likely to be nearly 500,000 tons less than in 1894.

The Lake Carriers Association is trying to make arrangements with the 1,500 longshoremen of Duluth and neighboring towns to reduce wages for the coming season. The lumber stevedore rates, which are now graded on a basis of 40 cents per hour with freight to Lake Erie at $1.75 per 1,000 ft., are to be the chief point of attack.

On Thursday last navigation about the harbors at the head of Lake Superior began, and a strong wind would take out the little ice in the lake. It looks like a very early opening from Buffalo to Duluth—something vessel men do not want.

It is claimed the Duluth, Missabe & Northern road will this year haul 2,500,000 gross tons of iron ore, at 80 cents a ton, and that the net profits of this will be $1,100,000. The road is expected to pay interest on its bonds held by Rockefeller, at net 20 per cent. on the stock.

Not a Lucky Number.

The Pittsburgh *Leader* publishes an account of a scheme to collect a fraudulent claim from the Pennsylvania Company which in its details furnishes a good basis for an entertaining detective story. In a bad wreck at Shreve, O., in September, 1892, a number of persons were killed and a good deal of the baggage in the cars was burned up. The claims had been about closed up when in May, 1894, John Lantz entered one for $30,000, saying that he had been injured in the back, had to go to an insane asylum for a year, and had suffered all sorts of misery. His chief collateral evidence was baggage check 2,793 for his carpenter's chest. Besides this he had a hatchet and a pair of draughtsman's dividers which had been picked up near the wreck and were found in the hands of a farmer near by. But the railroad lawyers and detectives seem to have been as sharp as the claimant, and they have torn his evidence to pieces, so that it is now in a pretty bad shape. No such strap check as 2,793, of the series which this one purported to belong to, could be found, but it was discovered that this had been 12,793, the brass having been filed so as to obliterate the 1. By searching the records for a long time it was found that 12,793 represented an empty box checked for a short trip just before the claim was presented and the box had never been called for. Then one of the road's lawyers, who was familiar with other claims connected with this wreck, remembered that the initials "W. R." on the draughtsman's dividers represented another claimant, and it proved that the dividers had been paid for; and finally the hatchet was found to belong to one of the express messengers who was killed in the accident. Lantz, whose real name is something else, has now been arrested and will be tried for perjury.

Directors and Their Profits.

The Tyrian Construction Co. was formed to construct a railway in Syria. The Syria Ottoman Co. had previously contracted to construct this railway, but the matter had fallen through. In September, 1893, a Mr. Sutherst agreed with the Syria Ottoman Co. to form a company to construct the line at the price of £11,500 per mile, payable in shares and debentures. The Tyrian Construction Co. was the company formed in pursuance of this agreement. The nominal capital of the company was £25,000, of which 55 per cent. was taken and paid for by a Mr. D'Avigdon, the balance being issued as fully paid to Mr. Sutherst. This capital was obviously inadequate for the construction of the line, and the contract was sublet to a firm of Chicago contractors, who agreed to perform the work at the price of £8,000. Prior to this subletting, the Chicago firm had written to Mr. Sutherst a letter, by which they agreed, in consideration of his influence in obtaining the contract, to place at his disposal the difference between £5,000 per mile and the contract price of £8,000, the total sum amounting (with an extra) to £382,000, and being, according to the Official Receiver (who was practically uncontradicted by Mr. Sutherst), a secret profit which Mr. Sutherst was to make out of the construction of the line, though there is apparently some ground for saying it was to be shared with another gentleman. By subsequent agreement this sum was reduced to £150,075. Mr. Sutherst's contention was that under the articles of the company he was entitled to make a profit. He said he embarked upon the undertaking for that purpose, and that he was perfectly justified in making what legitimate profit he could, it being entirely independent of the company. There is no doubt that certain companies have been formed with articles which allow their directors to make a profit out of the company. There was an article to that effect in the case of the South American and Mexican Trust, and our readers will remember the use to which it was put in the case of the Murietta business. It may seem a strong thing to say, but it may be doubted if an article more objectionable, or more open to abuse, could be devised. Its effect in the hands of an unscrupulous director is to enable him to use the company as a mere stalking-horse, through which he can earn commissions by the introduction to it of business which must obviously be of a somewhat shady description—the commissions, of course, as it is scarcely necessary to point out, being paid ultimately, if indirectly, out of the company he represents. It appears that there is no decision on the question whether such an article as that under discussion is valid, but, having regard to its mischievous character, such an article should certainly be held to be bad. We should be glad to see the Committee of the Stock Exchange refuse a quotation to a company with an article of this description.—*The Economist*.

LOCOMOTIVE BUILDING.

The Cleveland, Lorain & Wheeling is reported in the market for 100 coal cars.

The Grand Rapids & Indiana will soon order four consolidation locomotives.

The Southern Railway Co. has issued specifications and is asking bids on eight consolidation locomotives.

The Houston, East & West Texas Railroad will soon replace three of its old narrow gauge engines with new locomotives.

The Rogers Locomotive & Machine Works, of Paterson, N. J., has sold to the Poughkeepsie & Eastern an 8-wheel passenger locomotive with 17 × 22 in. cylinders.

The Seaboard Air Line has given an order to the Richmond Locomotive & Machine Works for five 10-wheel freight locomotives and seven American type locomotives for passenger service.

The Buffalo, Rochester & Pittsburg has made arrangements with the Brooks Locomotive Works for rebuilding a number of locomotives, which have been awaiting general repairs for some time. It is reported that an order has been given for the building of a number of new engines to the Brooks Works.

The Pittsburgh Locomotive Works has recently built two heavy engines for the Pittsburgh Junction Rail road similar to the engines built at the same works for the Duluth, South Shore & Atlantic last year. The engines have eight driving wheels, 42 in. in diameter, with a total wheel base of 23 ft. They weigh 160,000 lbs., with 148,000 lbs. on the drivers. The cylinders are 22 in. × 28 in.

CAR BUILDING.

The Indianapolis, Decatur & Western has contracted with the Pullman company for three first-class coaches.

The Bloomsburg Car & Manufacturing Co. received this week a large order for platform cars for one of the Mexican railroads.

The contracts for the 1,000 coal cars for the Pennsylvania lines west of Pittsburgh are reported as having been let this week.

The Jackson & Woodin Car Co., of Berwick, Pa., is reported to have received an order from the Delaware & Hudson Canal Co. for 150 box cars.

The Union Tank Line has placed an order for 50 tank line cars to be built at its Buffalo shops. These cars are of a new style and will be used in the California trade, and are part of an order for 100 to be built by the Union Tank Line, as stated in this column some weeks ago.

The award of the long talked of Missouri, Kansas & Texas order for 2,000 freight cars is still being delayed. The reason for the continued postponement in giving out the order is the delay in completing certain tests of material to be used in the construction of the cars. These tests are being made by the company's officers, and until they are completed and a satisfactory conclusion arrived at nothing will be known as to when the order will be given out.

BRIDGE BUILDING.

Atlanta, Ga.—The City Council has accepted the bid of the Edge Moor Bridge Co. for the erection of the new Broad street bridge for the sum of $22,200. There were 16 bids in all submitted, and they were as follows: Phœnix Bridge Co., $21,066; Edge Moor Bridge Works, $22,200; Watkins & Hardaway, $28,000; Nelson & McKaime, $27,300; Youngstown Bridge Co., $24,999; Pittsburg Bridge Co., $24,870; A. J. Hagerman, $22,265; Gude & Walker, $26,200; Wright Bridge Co., $27,000; Gillett Ezag Mfg Co., $19,300; Toledo Bridge Co., $26,167; Jasper Construction Co., $24,900; Wisconsin Bridge Co., $22,500; King Bridge Co., $23,000; Grant Wilkins, $25,400; Youngstown Bridge Co., $18,900.

Belleville, Ont.—The contract for a steel bridge over the Moira river at Belleville has been awarded to Robert Weddell, of Trenton. The contract price is $6,120.

Big Stone County, Minn.—An appropriation of $1,000 for a bridge across the Minnesota River in Big Stone county is included in a bill now before the State Legislature.

Boonville, Mo.—The bridge of the Missouri, Kansas & Texas over the Missouri River at this town is being rebuilt. This is a five-span structure; but two of the spans are already in position. The company is now asking bids for the material for the other three spans, including the draw span, and for the erecting work.

Centreville, Cal.—Plans, specifications and proposals will be received by the Clerk of the Board of Supervisors of Butte County at his office in Oroville up to April 1, for building a new bridge across Butte Creek at this place. The clear span will be 100 ft.

Cleveland, O.—The Cleveland Electric Railway Co. has offered to contribute $1,000 towards the construction of the new bridge in St. Clair street over Nine-Mile Creek to replace the present structure, the railroad company to have a double track across the bridge. The new bridge will be built by the County Commissioners.

Columbiana, Ala.—Proposals will be received until April 1, for building a steel bridge and approaches over Shoal Creek at Montevallo by R. H. Walker, at Columbiana.

Johnston City, Ill.—F. P. Read, Chief Engineer of the new Chicago & Carbondale Railroad, will shortly contract for an iron bridge of 100 ft. span on the line of that new railroad in Illinois.

Lexington, Mo.—A charter has been obtained by the newly organized Bridge & Terminal Co. of this place. One hundred and fifty thousand dollars will have to be raised in cash subscriptions, of which amount the company has already raise $116,000.

Mattawa, Ont.—A deputation has gone to Toronto to interview the Ontario government regarding the construction of an iron bridge to replace the wooden bridge now spanning the river at this point.

New York City.—The New York & New Jersey Bridge Company will be required to file new plans for that structure before June 7, 1895. If these should be rejected the project would probably be killed since time would not remain for the preparation of new plans.

The contract for erecting the swing bridge of the New York Central & Hudson River Railroad over the Harlem river, at Park avenue and 134th street, has been let by the King Bridge Co. to the Terry & Tench Construction Co., of Chicago.

Norristown, Pa.—A bridge is to be built over the Schuylkill at Airy street, which will be 135 ft. long, with a western approach of 245 ft., and an eastern approach of 3,900 ft. It will be 40 ft. wide, with a 30 ft. driveway and a 7 ft. passageway on the south side.

Ottawa, Ont.—The new bridge at the mouth of the Gatineau river is completed. The bridge consists of five spans. The steel superstructure is the work of the Dominion Bridge Co., of Lachine.

Portland, Ore.—Proposals are wanted until April 8, for the purchase of $200,000 bridge bonds. Address J. V. Beach, Clerk, Bridge Committee.

Rome, N. Y.—The City Council decided recently to ask authority of the legislature for the construction of a bridge across the Black River canal at Garden street. The bridge will cost $7,000 and the expense will be divided equally between the state and the city.

Santa Rosa, Cal.—A number of bids have been received for the construction of a bridge over Dry Creek, but they were all rejected and new bids have been advertised for. These will be received up to April 2.

Sherman, Me.—The new Patten & Sherman Railroad, which is to be built from the Bangor & Aroostook Railroad, will have a plate girder 50-ft. span near Sherman.

Taylor's Falls, Minn.—The St. Paul & Duluth Railway Co. proposes to build a railroad bridge over the St. Croix River at this place. The span will be 240 ft.

Wellington, Ont.—The Canada Bridge Co. has received a contract from the Dominion government for the construction of an iron bridge over the Rideau canal at Wellington.

Winnipeg, Man.—A new steel bridge will replace the old one at Osborn street, this city, and the City Council has applied to the local legislature for authority to issue debentures for $9,500.

York, Pa.—Press reports state that the contract for the superstructure of the Western Maryland Railroad bridge across the Codorous will soon be let.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago, Milwaukee & St. Paul, 50 cents, payable May 1.

Norfolk & Southern, quarterly, 1 per cent. payable April 10.

Sunbury & Lewiston, semi-annual, 4 per cent., payable April 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Canadian Pacific, annual, Montreal, Quebec, April 3.

Chicago & Alton, annual, Chicago, Ill., April 1.

Chicago & Grand Trunk, annual, Chicago, April 10.

Cincinnati, Saginaw & Machinaw, annual, Saginaw, Mich., April 16.

Joliet & Chicago, annual, Chicago, Ill., April 1.

New York Central & Hudson River, annual, Albany, N. Y., April 17.

Panama, annual, New York City, April 1.

Pittsburgh, Cincinnati, Chicago & St. Louis, annual, Pittsburgh, Pa., April 9.

Sterling Mountain, annual, New York City, April 2.

Toledo, Ann Arbor & North Michigan, annual, Toledo O., April 17.

Union Pacific, annual, Boston, Mass., April 24.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Car Accountants' Association* will hold its next meeting at the Palace Hotel, San Francisco, Cal., on April 16, 17, 18 and 19.

The *Association of Railroad Air-Brake Men* will hold its next annual meeting in St. Louis, Mo., from April 9 to 11. The headquarters will be at the Lindell Hotel.

The *General Baggage Agents' Association* will meet in Houston, Tex., April 10.

The *American Railway Association* will meet at the Planters' Hotel, St. Louis, Mo., on April 17.

The *Master Car Builders' Association* will hold its annual convention at Thousand Islands, Alexandria Bay, N. Y., commencing June 11.

The *Master Mechanics' Association* will hold its convention at the same place, commencing June 17. Applications for rooms for both conventions should be made to J. B. Wistar and Charles W. Crossman, both at Thousand Islands, Alexandria Bay, N. Y.

The *International Railway Congress* will meet at the Imperial Institute, London, England, beginning June 26.

The American Society of Civil Engineers will hold its annual convention at Nantasket Beach, commencing June 18.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the fourth Wednesday of January, March, April, September and October, at 10 a. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets on the first Wednesday in each month, at 8 p. m. The headquarters of the society are at 1736–1739 Monadnock Block, Chicago. The business meetings are held on the first Wednesday at its rooms. The meetings for the reading and discussion of papers are held on the third Wednesday at the Armour Institute, Thirty-third street and Armour avenue.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, 36 Bromfield street, Boston, on the third Wednesday in each month, at 7.30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets in the Carnegie Library Building, Allegheny, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday in each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. B. W. Gardner, Monadnock Block, Chicago, is secretary of the association.

The *Association of Civil Engineers of Cornell University* meets on Friday of each week at 2:30 p. m., from October to May, inclusive, at their association rooms in Lincoln Hall, Ithaca, N. Y.

The Western Railway Club.

The Western Railway Club met March 19 at the Armour Institute, Chicago. The club was specially invited to meet at that place and examine the Institute and its methods of work. Nearly all of the 140 in attendance at the meeting arrived early and spent an enjoyable hour in going over the Institute under the charge of Professor Hatch, of the mechanical department, and especially detailed students. The meeting, held later in the lecture hall and presided over by Mr. George Gibbs, President of the club, was opened with an address of welcome from President Gunsaulus of the Institute. "Signaling" was the first topic discussed at the meeting, being based upon the paper on "Modern Practice in Signaling," read at the February meeting by Mr. George Gibbs. The discussion was quite extended and was participated in by signal engineers of various railroads and representatives of signal companies. The mechanical department of railroads was heard from through locomotive engine runners as well as through the heads of departments. A paper on "The Train Staff System" was presented by Mr. C. A. Goodnow, Division Superintendent of the Chic., Mil. & St. P. Ry., upon which road this method of running trains was first introduced in this country. Following this came an interesting discussion upon "Stationary Boiler Practice and Shop Heating." At this meeting 28 new members were admitted.

The Western Society of Engineers.

The Western Society of Engineers met Wednesday evening, March 20, at the Armour Institute, with President Horton in the chair, to listen to a paper by Mr. W. R. Roberts describing the new rolling lift bridge at Van Buren street, Chicago. Mr. Roberts' paper, which was unusually well calculated to interest a large audience, was quite profusely illustrated, and the drawings and photographs were finely projected by the excellent electric lantern which the Institute provides for such occasions. Considerable discussion followed, in the course of which the Halsted steel lift bridge design was defended; and a view of the London tower bridge was also given.

Engineering Association of the South.

The March meeting of the Association was held at Nashville on the 14th inst., 13 members and 2 visitors being present. It was voted to hold a meeting hereafter on the fourth Thursday in each month, in addition to the regular business meeting on the second Thursday, for informal discussions. The paper by Professor Schuerman, on the Method of Determining the Probable Volume of Traffic on a New Railroad, was concluded. A discussion on the Preservation of Iron Surfaces was also taken up.

New York Railroad Club.

The club met upon March 21, at the house of the American Society of Mechanical Engineers, 12 West Thirty-first street. Two topical questions were discussed. Mr. A. E. Mitchell, Superintendent of Motive Power of the New York, Lake Erie & Western, addressed the club upon the subjects "Tools on Locomotives," giving particular attention to the reduction of their number, and to means for checking them to prevent losses. Mr. Mitchell suggested placing a box upon each locomotive in which all necessary tools could be kept. He also presented a list of the tools which he considered absolutely indispensable in ordinary service. An interesting discussion followed, and this list was much changed by those present. The matter was left open, to be brought up for further discussion at the April meeting.

Copies of the Chicago agreement for interchange of cars were distributed, and in the discussion which followed, many valuable points were brought out by those who took part.

Railroad Air-Brake Men.

We announced in our issue of Feb. 22 the meeting of the Association of Railroad Air-Brake Men, to be held April 9 to 11, at St. Louis; headquarters Lindell Hotel; chairman on Committee of Arrangements, Mr. F. N. Nellis, address care of Secretary of the Association, Pine Bluff, Ark. The subjects selected for reports and the chairmen of the committees are given below. We do not give the names of the members of the committees other than the chairmen.

Pump Governors and Air Gages.—Otto Best, Chairman.

Foundation Brakes.—S. J. Kidder, Chairman.

Care of Signal Apparatus and Conductor's Valve.—F. W. Bronnax, Chairman.

Care of Engineer's Brake Valve.—Robert Burgess, Chairman.

Economical Oiling and Cleaning of Brake Cylinders.—Waldo Marshall, Chairman.

Main Reservoir and Connections.—Clyde Farmer, Chairman.

Maintenance of Freight and Passenger Brakes.—P. J. Carney, Chairman.

Handling of Trains on Mountain Grades.—T. A. Hedendahl, Chairman.

Driver and Engine Truck Brakes.—C. C. Farmer, Chairman.

Slid Flat Wheels.—F. B. Farmer, Chairman.

Slack Adjusters.—Paul Synnestvedt, Chairman.

Piston Rod Packing.—C. B. Conger, Chairman.

PERSONAL.

—Mr. W. P. Pike, Superintendent of the Louisville Division of the Louisville & Nashville Railroad, died at Louisville, Ky., last week from blood poison.

—Mr. West M. Holt, Superintendent of the dining and sleeping cars of the "Soo" Railroad, died at Milwaukee, Wis., on March 22, from the effects of a surgical operation.

—Mr. J. W. Schaub, M. Am. Soc. C. E., has accepted the position of chief engineer and manager with the Hamilton Bridge Co., at Hamilton, Ont., to take effect April 15th.

—Mrs. Dwight M. Philbin, the young wife of the General Manager of the Duluth, Missabee & Northern road, died a few days ago and has been buried at her former home, Marquette, Mich.

—Mr. A. D. Allibone, Vice-President and Treasurer of the Duluth, Missabe & Northern Railroad, at Duluth, has resigned his position with the railroad, the resignation to take effect on May 1.

—Mr. Henry Terrell's appointment as Receiver of the San Antonia & Gulf Shore Railroad, in Texas, owning 20 miles of railroad, has been confirmed by the Court of Civil Appeals of San Antonia, Tex

—Mr. S. W. Huston, who has recently been with the Pittsburgh Locomotive & Car Works, is now with the Lukens Iron & Steel Co., of Coatesville, Pa., in charge of the mechanical department of that company.

—The many friends of Mr. E. L. Corthell will be glad to learn that he has been discharged from the care of his surgeon, Professor Kocher, and has gone to Nice to re-establish his strength by outdoor exercise in that mild climate. Mr. Corthell hopes to be in America again in April.

—Mr. Alexander Jackson has resigned as General Agent for the Denver & Rio Grande at Pueblo, Col., to accept the position as City Passenger Agent in Denver for the Chicago, Burlington & Quincy. Walter G. Adams, Freight Agent in Pueblo, is promoted to the vacancy caused by Mr. Jackson's resignation.

—Mr. T. P. Carpenter, recently elected Commissioner of the Buffalo Soft Coal Traffic Association, has opened offices in the Coal and Iron Exchange building at Buffalo. Mr. Carpenter was recently General Passenger Agent of the Northern Steamship Co., and assumes his new duties on April 1.

—Mr. H. T. Newcomb, who has been employed as an expert by the Interstate Commerce Commission since its organization, and the author of numerous pamphlets and magazine articles on railroad topics, has been appointed Chief of the Freight Rates section in the Division of Statistics of the Department of Agriculture at Washington, D. C.

—Mr. Jay C. Morse, who has been President of the Illinois Steel Company for the last few years, since the resignation of Mr. Potter, has resigned the presidency of the company, but retains the chairmanship of the Board of Directors. His successor as President is Mr. J. W. Gates, now General Manager of the Consolidated Steel and Wire Company.

—Mr. M. J. Lorraine, who has been located at Prescott, Ariz., for the last few years, having in charge the building of the railroad machine shops and roundhouse of the Santa Fe, Prescott & Phœnix Railroad at that point, as engineer, has recently resigned, the shops being now completed, and will go to California to take a position on the San Francisco & San Joaquin Railroad.

—Mr. George A. Burt has been elected Director and later Vice-President and General Manager of the Ohio River Railroad. Mr. Burt is an ex-General Superintendent of the Panama Railroad Company; he was General Manager of the Brazil Mail Steamship Co., and until the recent sale of the vessels comprising the Panama Railroad Company's Columbian Line was the representative of the owners of these vessels.

—Mr. Paul Hill, who died at Lowell, Mass., on March 23, aged 79 years, was in former years eminent as a constructing engineer. He assisted in superintending the construction of the Northern Canal in Lowell, in 1846, and for many years was constructing manager of the water-works of locks and canals. He was Superintendent at Hoosac Tunnel, built the breakwater dike at Cape Cod, and did other extensive engineering work in New England and the West.

—Mr. G. M. Hughes, General Manager of the Atlantic & Danville Railroad in Virginia, resigned that position this week. He had been with the company since 1889 as General Superintendent, becoming General Manager in 1892. He was formerly on the Norfolk & Virginia Beach road as Superintendent, and has been engaged on the Baltimore & Ohio in various capacities in the operating department, and also on the construction of some of its branch railroads.

—Mr. W. J. Haylow has recently been appointed Superintendent of Transportation of all the railroad lines of the Plant System in Florida. This is a new office on these lines and follows the appointment of General Superintendent some weeks ago. Hereafter the Plant railroad lines will have five Division Superintendents. Mr. C. S. Gadsden remains as Superintendent of the Charleston & Savannah at Savannah, Mr. B. R. Swoop as Superintendent of the South Florida Division of the Savannah, Florida & Western, and Mr. George W. Haines, as Superintendent of the Brunswick & Western, but Mr. Haines is also appointed Superintendent of the Georgia Division of the Savannah, Florida & Western, with office at Savannah, Ga., to succeed the late Captain R. G. Fleming. Mr. J. W. Craig, who has been Master of Transportation of the Charleston & Savannah, has been appointed Superintendent of the Savannah, Florida & Western south of Dupont, Ga., to Lakeland, Fla. Mr. C. L. Parker becomes Superintendent of the Alabama Midland. The office of Assistant Superintendent at Montgomery, Ala., held by Mr. A. A. Aveihle and at Ocala, Fla., held by Mr. J. A. Larnerd have been abolished. Mr. Haylow, who has been made Superintendent of Transportation, has been Master of the Transportation of the Alabama Midland and Savannah, Florida & Western Lines west of Thomasville, Ga.

—Mr. Edward P. North, M. Am. Soc. C. E., is appointed Water Purveyor in the Department of Public Works, New York City, to take effect April 1. The title of this office is singularly misleading. The Water Purveyor, so far as we can learn, has nothing to do with water; he has, however, charge of construction, maintenance and repairs of all pavements in the city, new and old, except macadam and earth roads. Apparently the duties of the office have varied from time to time with the caliber of the incumbent and the exigencies of politics; but it is obvious that as its duties actually are this office is essentially an engineering one. Strange to say, it has never before been held by a civil engineer. Of Mr. North's fitness for the place we need hardly say anything to our readers. The work is precisely in line with a good deal that he has done and thought about and written about in the past, and besides being a good engineer he is a man of energetic character. Moreover, he is a man of rectitude and his sense of professional duty and personal honor is almost Quixotic. Surely these are rare qualities in the public life of New York City, and we have no doubt there is astonishment in store for many of the people with whom Mr. North is brought in contact. While we congratulate the city upon the appointment we question very much if Mr. North will consider the salary an equivalent for the peace and scholarly leisure which he surrenders.

ELECTIONS AND APPOINTMENTS.

Cleveland, Akron & Columbus.—The Directors elected at the recent annual meeting were George W. Saul, William Chisholm, Frank Rockefeller, L. M. Coe, James H. Hoyt, of Cleveland, O.; R. M. Gilbert, of Columbus, and M. W. Barse, of Buffalo. Two changes were made in the board, Messrs. Rockefeller and Coe succeeding George S. Russell, of Cleveland, and H. B. Morehead, of Cincinnati.

Gulf, Beaumont & Kansas City.—The stockholders held their annual meeting at Beaumont, Tex., on March 20, and elected the following directors: E. E. Pratt, Boston; N. B. Silsbee, Boston; John H. Kirby, Houston; W. C. Averill, Wm. Wiess, John Gilbert, W. A Fletcher, Beaumont. The Directors elected E. E. Pratt, of Boston, President; John H. Kirby, Houston, Vice-President and Genoral Manager; W. C. Averill, Beaumont, Secretary and Treasurer: N. D. Silsbee, Boston, Assistant Treasurer; George D. Silsbee, Boston, Assistant Secretary.

Missouri Pacific.—The recently-elected Directors of the company met at 195 Broadway, New York City, on March 20, and re-elected the executive officers, as follows: President, George J. Gould; Vice-President and General Auditor, C. G. Warner; Secretary and Treasurer, A. H. Calef; General Counsel, John F. Dillon.

Mobile & Ohio.—The following officers of the railroad company have been elected: Chairman of the Board, W. Butler Duncan; President, J. C. Clark; Vice-President, James H. Fay; General Manager, J. G. Mann; Secretary, Treasurer and Transfer Agent, H. Tacon;

General Auditor, R. V. Taylor; General Solicitor, E. L. Russell; Assistant Secretary and Transfer Agent resident in New York A. Mackintosh.

Pennsylvania.—The old Directors have been re-elected, as follows: George B. Boberts, Alexander M. Fox, Alexander Biddle, N. Parker Shortridge, Henry D. Welsh, William L. Elkins, H. H. Houston, A. J. Cassatt, C. A. Griscom, B. B. Comegys, Amos R. Little, William H. Barnes and George Wood. Vice-Presidents Thomson, Green and Pugh are members of the board by virtue of their positions. President Roberts is the senior member of the board in length of service, having entered it on May 3, 1869, as fourth vice-president. The next oldest member is Alexander M. Fox, who was elected November 24, 1871. A. J. Cassatt comes next, having been made third vice-president and a member of the board on June 24, 1874.

J. W. Stone, Assistant Superviser at Gallitzin, Pa., has been promoted to supervisor at Columbia, Pa., succeeding George H. Brown, son of Chief Engineer Brown, transferred to a like position at Washington.

Plant System.—The following appointments have been recently announced: W. J. Haylow appointed Superintendent of Transportation of the railroads of the Plant system, with office at Savannah, Ga.; George W. Haines, Superintendent of the Brunswick and Western Railroad, and of the Savannah, Florida & Western Railroad lines between Savannah and Jacksonville, and Waycross and Dupont, with office at Waycross, Ga.; J. W. Craig, Superintendent of the Savannah, Florida & Western Railway lines between Dupont, Ga., and Lakeland, Fla.; Hight Springs, Fla., and Gainesville, Fla.; Fort White, Fla., and Lake City, Fla.; also the Silver Springs, Ocala & Gulf Railway, with office at High Springs, Fla.; C. O. Parker, Superintendent of the Alabama Midland, the Abbeyville Southern and the Savannah, Florida & Western lines west of Dupont, Ga., extending to Chattahoochee, Bainbridge and Albany, Ga.; and Monticelo, Fla., with office at Montgomery, Ala; B. R. Swope, Superintendent of the Savannah, Florida & Western, between Sanford, Fla., and Port Tampa, Fla.; Sanford, Fla., and Oveido, Fla.; Kissimmee, Fla., and Narcoosee, Fla.; Bartow Junction and Bartow, Fla.; Lakeland, Fla., and Bartow, Fla.; also Winston & Bone Valley Railroad; also Tampa & Thonotassa Railroad, with office at Sanford, Fla.; C. S. Gadsden, Superintendent Charleston & Savannah, with office at Charleston, S. C. The position of Assistant Superintendent is abolished.

San Antonio & Gulf Shore.—The Board of Directors of the railroad have elected the following officers: President, ex-Governor John Ireland; Vice-President, C. G. Clifford; Secretary, R. E. Sadler; Treasurer, J. B. King. C. G. Clifford was appointed General Manager of the road, with office at San Antonio, Tex. This is the road of which William Davis, of San Antonio, was projector and President.

Texas & Pacific.—Stockholders of the railroad held their annual meeting in New York City, on March 20, and re-elected the old Board of Directors, with the exception that Dr. John P. Munn takes the place made vacant by the death of E. B. Wheelock. The following executive officers were chosen: President, George J. Gould; Vice-President, S. H. H. Clark; Secretary and Treasurer, C. E. Satterle; Third Vice-President and General Manager, L. S. Thorne.

Unadilla Valley.—August Graf has been recently appointed Auditor, with headquarters at 80 Broadway, New York city.

Wabash.—Robert F. Kelly, who has been traveling Passenger Agent of the Wabash at Louisville, will on April 1 become Eastern Passenger Agent of the same road, with headquarters at New York, succeeding L. S. McClellan.

Zanesville Terminal.—This company held its annual meeting at Columbus, O., this week, and elected the following officers: Directors, D. S. Gray, P. W. Huntington, F. C. Hubbard, G. W. Sinks, Columbus; Chase Andrews, Zanesville. The Directors elected officers as follows: President, D. S. Gray; Secretary, L. W. Neeseamer; Treasurer, F. W. Prentiss; Auditor, W. D. McKinney. The property owned by this company is under lease to the Columbus, Sandusky & Hocking road.

RAILROAD CONSTRUCTION,

Incorporations, Surveys, Etc.

Baie des Chaleurs.—N. K. and M. Connolley have received the contract for the construction of the extension of this road, from near Caplin to Pasbebrac, Quebec, 20 miles, including a large bridge over the Bonaventure River.

Chicago & Carbondale.—This railroad has now been located from Johnston City, a point on the Chicago, Paducah & Memphis Railroad, southeast to the town of Carbondale, where it connects with the Chicago & Texas, that railroad extending to the Mississippi River, opposite the terminus of the St. Louis, Cape Girardeau & Southwestern Railroad. The projectors point out that they secure a direct connection to Galveston by the St. Louis Southwestern Railroad, which connnects with the Cape Girardeau line, and that by the construction of the railroad between Johnston City and Carbondale, connecting at Altamont with the Wabash Railroad, they secure a new direct route from Chicago to Galveston. The new railroad is being built by Johnston Bros. & Fought, of St. Elmo, Ill., who built the Chicago, Paducah & Memphis Railroad. The grading and bridging will be commenced at once, and it is proposed to push this work to as early completion as possible, and the tracklaying will not be delayed. F. P. Read, who is the Chief Engineer of the Chicago, Paducah & Memphis, holds the same position on the new railroad.

DeKalb & Great Western.—Articles of incorporation were filed at Springfield, Ill., this week by this company. The proposed road is to extend from a point on the Chicago Great Western at, or near, Sycamore, to the city of DeKalb, in DeKalb County, Illinois. The capital stock is $100,000. The incorporators are John L. Pratt, of Sycamore; E. C. Lott, of DeKalb; R. C. Wight, of St. Paul, Minn.; Raymond Du Puy, an officer of the Chicago Great Western, and F. M. Montgomery, of Chicago.

Grand Marais & North Shore.—This railroad has been incorporated to build along the north shore of Lake Superior. Its chief traffic would be fresh fish from half a dozen hamlets along 180 miles of coast line. The projectors say the right of way has been secured.

Genessee & Wyoming Valley.—The line from the Retsof salt mines to Caledonia, N. Y., a distance of 14 miles, is about completed, and will, it is understood, be operated by the Lehigh Valley. The road will have a good business in transporting salt, and will at the same time give to the Lehigh Valley new connections with the Western New York & Pennsylvania, the Buffalo, Rochester & Pittsburgh, the Erie, the New York Central and the Lackawanna.

Gulf & Interstate.—Track laying on the railroad, from Bolivar peninsular, opposite Galveston, has reached the 16-mile post, and the entire force of tracklayers and laborers will be sent to Beaumont at the northern end of the division now under construction to begin the work of permanent construction from that end of the line. It is the intention to push the work from Beaumont to Bolivar as rapidly as possible in order to handle the heavy lumber traffic from the district along the Sabine River.

Hendersonville & Brevard.—Warren, Jencks & McNeely, who are now building this railroad in western North Carolina, will have the road completed in May. The road starts from Hendersonville, N. C., 17 miles south of Asheville on the Asheville & Spartanburg Railroad, and extends west via Bowman's Bluff to Brevard, a distance of 22, miles through the French Broad Valley. The road goes through a rich farming country and reaches a hard wood lumber district. Construction is being pushed vigorously, night forces working on the grading, and the road is to be completed in 50 working days. Although in the heart of the mountains the work is very light and the grades and curvatures are at the minimum. There will be two steel bridges, one 100 ft. in length, furnished by the King Bridge Co., Cleveland, Ohio, and one 60 ft. in length, furnished by the Union Bridge Works, Athens, Pa. The sub-contractors are T. S. Pruden, Gulf, N. C., for the grading; W. J. Neely, Clay Hill, S. C., cross ties; J. A. McGuire, Brevard, N. C., trestling, and T. S. Boswell, Brevard, N. C., masonry.

About $70,000 in local aid has been voted to the company, $60,000 in county bonds being voted by Transylvania county and the balance by Hendersonville township. The capital stock of the company has been placed at $250,000 and six per cent. general mortgage bonds amounting to $150,000 have been authorized. A. E. Boardman, of Brevard, N. C., is President and J. R. Brooks is Chief Engineer. The headquarters of the company are at Hendersonville, N. C.

Intercolonial.—The Dartmouth branch, which is to give the Intercolonial a new line into that town, located opposite Halifax, is now well under way, the contract having been let in January last. The branch leaves the main line at Windsor Junction, 14 miles east of Halifax, passes through the town of Waverly, skirts the western shore of Lake William, thence across country to the Bedford Basin, and connects with the old Dartmouth branch at Tuft's Cove on Halifax Harbor, opposite Halifax. The length of the new line is 10 miles. The former Dartmouth branch crossed the Narrows of Halifax Harbor, and followed the east shore of the harbor to Dartmouth, but the bridge at the Narrows was destroyed last year and it was decided to build the branch now under contract instead of rebuilding the bridge. Thomas Cooke, of New Glasgow, has the contract for the first five miles from Windsor Junction to Station 290, and Daniel McGregor & Son, of New Glasgow, have the contract for the part from Station 290 to Tuft's Cove, at Dartmouth five and a half miles. The greater part of the line is in the "glacial drift" which overlies the bed-rock of compact quartzite to depths as great as 30 ft. This "drift" consists of a base or matrix which varies from hard indurated clay and cemented gravel to loose sand, and includes a large percentage of angular boulders confusedly intermixed, and is consequently difficult to excavate. The maximum grade is 52 ft. a mile. The maximum curve is 6 deg., with one exception, which is an 8-deg. 45 min. through a 40-ft. cutting, on a level. The branch to be built and equipped at the expense of the Dominion Government, which operates the intercolonial. The work embraced in the contracts—clearing, excavation of line cuttings, fencing, etc.—is to be finished by July 31. The filling is about 25 per cent. in excess of the excavation, and as no borrow is to be had on the line, the Railway Department will complete the embankments after the contracts are completed. The work is under the supervision of P. S. Archibald, Chief Engineer of the Intercolonial road.

Iowa, Lake Superior, & Gulf.—This company has been recently organized at Fremont, Neb., as the Nebraska division of the Gulf & Interstate road, chartered in Kansas. The company has elected officers as follows: President, J. S. Freeman, Columbus, Neb.; Vice-President, G. C. Davis, Carroll; secretary, J. R. Rundell, Wayne; Treasurer, J. W. James, Platte Center; Chief Engineer, R. H. Jones, Winside, and Superintendent of Construction, W. R. Carter, Lincoln.

Jacksonville, St. Augustine & Indian River.—It is announced from Florida that H. M. Flagner, of New York, has accepted the final survey of the civil engineers on the route for a railroad from West Palm Beach, on Lake Worth (the present terminus of this railroad which he controls), to Miami, on Biscayne Bay, a distance of 65 miles, and that he will immediately begin the construction of a railroad between these two points. The road will be built as far as New River, about halfway, without delay, in order, presumably, to have it in operation in time to connect with a fast passenger steamer from New River to Nassau, N. P., early next Winter. Mr. Flagler has purchased one-half of Key Largo, at the foot of Biscayne Bay, and the largest and most important in the long chain of keys which skirt the lower peninsula of Florida.

Kansas City, Watkins & Gulf.—J. B. Watkins, President of the company, has proposed to build this road into the city of Natchez from Alexandria, if Natchez donates a right of way through the city and county, 160 acres of ground for terminal facilities, yards, station grounds, etc., and subscribes to the enterprise $200,000 in cash or its equivalent.

Langenburg & Southern.—This company is applying to the Dominion Parliament for power to construct a railroad from Langenburg, Northwest Territories, southwest 35 miles to Elkhorn, Manitoba, on the Canadian Pacific.

Manchester & Augusta.—The proposed branch of this road from a point on the Charleston, Sumter & Northern Railroad, now included in the Atlantic Coast Line to connect with the main line of the Manchester & Augusta Railroad, is to be about six miles long. It has not been finally located. The southern terminus, however, will be at a point called Ellorree in South Carolina The line will be wholly in that State. There will be no bridges and but little grading. The maximum grades will not exceed 30 ft. to the mile. It has not been fully decided to build this line.

Manitou & Pike's Peak.—The summer season of this line, the railroad up Pikes Peak, will open early in April. A connecting line will be laid down the canon to meet the electric line from Colorado Springs.

Merrill, Antigo & Eastern.—This company was organized sometime ago in Wisconsin to construct a road from Antigo to Prentice via Merrill. H. M. Bell, formerly Superintendent of the Milwaukee & Northern has just been appointed Superintendent of Construction of this company, and will be engaged in the construction of the road from Antigo to Prentice, a distance of about 70 miles. It is intended to begin the construction of the line out of Antigo at once.

Mexican Roads.—A dispatch from Mexico announces that the Federal Government has approved the concession granted to an American syndicate, of which George M. Pullman is a stockholder, for the construction of a railroad from the coal fields at Bororteau, Mex., to Nueva Laredo, and thence along the Rio Grande border to Matamoras. The proposed road is subsidized by the Federal Government for a distance of 350 kilometets.

New Roads.—A new railroad is to be built from the coal fields of West Virginia, through Harrisonburg, Va., and Rockingham county, of which Harrisonburg is the county seat, has subscribed $150,000 toward its completion to Tidewater, Va. The above subscription will be payable when the road (not yet named) is built from Elkton to a point on the Dry River, near Harrisonburg.

The new railroad from the Lexington & Eastern Railroad, in Powell county to Walnut Grove, in Morgan county, Ky., will be built by a company of which W. D. Wallbridge, of the American Coal Co., 1 Broadway, New York City, is President. The length of this line is to be 28 miles from the connection with the Lexington & Eastern, extending through Campton and Hazel Green, in Wolf county, to the terminus in Morgan county. The line has not yet been surveyed, but it is expected to have this done early this spring, and it is hoped that everything will be in readiness to commence work at an early date. There will be one tunnel on the line and probably seven bridges.

Col. Albert Boone, of Zanesville, O., the promoter of the Black Diamond railroads, is now giving his attention to railroad projects in Tennessee, and has issued a call for a "mass-meeting" at the court house in Knoxville, Tenn., April 3, for the promotion of a line projected from State Line station, Tennessee, to Jellico, on the Louisville & Nashville, thence via Knoxville, Tenn., on the Southern Railway to Franklin, North Carolina, to Robin Gap, in Georgia, and thence to the sea.

The owners interested in the Noble Five Mountain mines, near Nelson, B. C., propose to build a short railroad from the Cody Creek end of the Government road to the Bonanza King.

A number of residents of McDowell County, W. Va., have agreed to subscribe some thousand acres of land toward the building of a railroad from Jaeger, W. Va., on the Norfolk & Western Railroad to the head of Dry Fork, and a Chicago firm has been asked to undertake the construction of the road. The territory through which this road would pass is mostly forest.

Ottawa, Amprior & Parry Sound.—The contract for the construction of 10 mile of this railroad west of Long Lake, Ont., has been awarded to Poulon & Fitzpatrick. Contracts have also been awarded to Fauquier, Oniel & Fergueson, for two ten-mile sections. In May, a force of 1,500 men will be put on to rush the work through.

Patten & Sherman.—The survey for this short railroad, which is practically a branch of the Bangor & Aroostook Railroad, leaving that line at Sherman station, was completed last week. The route is nine miles long from Sherman to Patten. The grading will be light, averaging not over 2,000 yds. per mile. The only bridge is one of 50 ft. span. The grades are not over one per cent., except on one section of 2,500 ft., where the maximum is 67 ft. to the mile. The railroad will be built chiefly through township subscriptions to the stock, the town of Patten voting $20,000 and Sherman $10,000. The total capital stock will be $52,500, all of which has been subscribed. W. Z. Earl is Chief Engineer. A. A. Burleigh, of Houlton, President of the Bangor & Aroostook Railroad, is the originator of the branch railroad. He expects that the actual construction work will be begun in April and the contract for grading the line will be given out without delay.

Plymouth County.—The contract for building this road through Plymouth County, Mass., has been let to John Leavett, of 213 Huntington avenue, Boston. There are no iron bridges to be built, and only two trestle bridges over the North River. The route begins at East Weymouth, on the South Shore branch of the Old Colony Railroad, and extends thence through Hingham, Norwell and Marshfield to Brant Rock in Marshfield, with a loop connecting Hanover branch at Hanover with the other line at North Marshfield. The total length of the road will be 25 miles. The officers of the company are John F. Simmons, President, Equitable Building, Boston; Charles S. Cushing, Vice-President; Charles H. Killam, Treasurer, and E. Worthington, Jr., 53 State street, Boston, Chief Engineer.

San Antonio & Brownsville.—A surveying party has started out from San Antonio, Tex., to locate this line. When the road has been surveyed as far as Pleasanton application will be made to the State Railroad Commissioners to issue bonds for construction. The promoters of the enterprise are J. S. Doak, of St. Louis, President; J. M. Puett, of St. Louis, Vice-President and General Manager; J. A. Hinman, of St. Louis, Chief Engineer.

Southern & Western.—The Board of Commissioners of Brunswick County, South Carolina, have called an election for April 24 in Smithville, and other townships, for the citizens to vote upon the question of issuing bonds in behalf of this railroad. It is proposed to issue $65,000 in bonds, divided between four townships. The railroad is chartered to run from Southport to Conway, S. C.

Southwestern Mineral.—Tracklaying was completed March 18, on this branch of the Missouri, Kansas & Texas, commencing at a point seven and one-half miles south of Parsons, Kan., running due east into Cherokee County, a distance of 17 miles, to the mines of the Southwestern Coal & Improvement Co. Mr. A. F. Edwards, of Parsons, Kan., was the contractor for the grading and trestle work of this branch.

Stones River.—The project for a railroad east of Murfreesboro, Tenn., mentioned a few weeks ago, has been organized as the Stones River Railway Co., with J. E. Thompson, of Murfreesboro, Tenn., as the President. This railroad is to be about 15 miles long, extending from Murfreesboro via Readsville and Broxton to Woodbury, a distance of 15 miles. The survey has just been completed by Oscar Jones, the chief engineer. The contract for grading the railroad has not yet been given out, but the officers state that all arrangements for completing the line and putting it in operation have been decided upon, and that the line will be built immediately.

Wichita Falls.—Track is now being laid on this local railroad which is to give the Missouri, Kansas & Texas

a connection with the important town of Wichita Falls in northern Texas. The branch will extend from the present terminus of one of the Missouri, Kansas & Texas branches at Henrietta northwest to Wichita Falls, the distance being about 18 miles. The work is being done by a local company of which J. A. Kemp is President, but the railroad will be operated by the Missouri, Kansas & Texas under a traffic arrangement. The branch is parallel to the line of the Fort Worth & Denver City Railroad, the main line of which crosses the present line of the Missouri, Kansas & Texas at Henrietta. Burkett Brothers, of Tyler, Tex., were the contractors for the grading of the railroad, that work having just been completed.

GENERAL RAILROAD NEWS.

Allegheny Valley.—The report of the road for the year ending Dec. 31, 1894, shows the following results of operations during the year: Earnings $2,176,707, expenses $1,351,780; total net income $824,927. State taxes were $25,668 and interest $1,127,580, leaving a deficiency of $328,321. Compared with 1893 gross earnings decreased $260,108, expenses $208,008, net income of $52,099. The State loan of $100,000 due Jan. 1, 1894, was paid on maturity. The capital stock outstanding is $26,443,733, including $15,896,350 of preferred shares, and the total bonded debt is $16,889,982. During the past year there were issued $11,359, of preferred stock and $8,000 general mortgage four per cent. bonds, against income bonds of the old company taken up and conversions.

Atlanta & Florida.—The foreclosure sale of this road has been postponed until April 29 by Judge Newman, of the United States Circuit Court of Atlanta. The postponement was granted on the petition of the stockholders who had objected to certain claims of the Central Trust Co., of New York, being allowed by the court.

Cleveland, Akron & Columbus.—The following table gives the earnings and expenses of this road for the seven months of the fiscal year from July 1, 1894, compared with the same period of the previous year:

Seven Months:

	1895.	1894.	Inc. or Dec.	
Gross earnings	$499,465	$539,417	D.	$39,952
Operating expenses	308,353	284,785	D.	76,432
Net earnings	$191,112	$154,632	I.	$36,480

Indiana, Illinois & Iowa.—Donald McIntosh and John McIntosh, of Milwaukee, Wis., have filed a complaint in the United States Court at South Bend, Ind., asking for the sale of this railroad on mechanics' lien foreclosure proceedings to satisfy a claim of $125,000. The plaintiffs are railroad contractors and built the extension to South Bend, opened last December. They claim a large sum as still due them for this work, not as large as the sum mentioned in the suit, but the officers dispute their claims.

Lake Erie & Western.—The company's report for the year ended Dec. 31 gives the following comparison of earnings:

	1894.	1893.	Inc. or Dec	
Gross earnings	$3,315,403	$3 512,620	D.	$167,217
Oper. expenses	1,865,851	2,048,743	D.	182,892
Net earnings	$1,479 552	$1,463,877	I.	$15,675
Fixed charges	682,982	650 470	I.	32,512
Balance	$796,570	$813,407	D.	$16,837
Div. p. 5 p. c. on pfd	592,009	592,000		
Surplus	$204.570	$221,407	D.	$16 838

President Calvin S. Brice shows in his report that since 1887 the company has expended $3,747,865 for permanent improvements and additional equipment, and in 1890 $600,000 was paid for the acquisition of the Fort Wayne, Cincinnati & Louisville Railroad. All of the payments for betterments and improvements ($1,943,977) and more than $300,000 of the amount paid for new equipment were taken out of the net earnings of the company, only $2,100,000 of the second mortgage bonds authorized for these purposes having been sold, leaving $1,525,000 in the company's treasury.

Mexican National.—The annual report of the railroad makes the following comparison with 1893:

Year Dec. 31.	1894.	1893.	Inc. or dec.	
Gross earnings	$4.329,079	$4,224,804	I.	$104.275
Oper. Expenses	2,437.116	2,586,366	D.	149 250
Net earnings	$1,891,963	$1,638,438	I.	$253,525
Net reduced to U. S. currency	$1,513,570	$1,295,096	I.	$217,474
Other income	99,110	.....	I.	99,110
Total net	$1,612,680	$1,296,696	I.	$316,584
Fixed charges	1,487,512	1,273,528	I.	213,984
Surplus	$125 168	$22,568	I.	$102,600
Total surplus	149,938	24,772	I.	125,166

The company has adopted an arbitrary rate of 80 cents to the dollar as a basis of converting its Mexican dollars into United States gold, but the actual loss of late years has been much greater, and this loss is charged in the item of "exchange." In 1892 this item amounted to $248,622, in 1893 to $434,242 and in 1894 to $708,119, these sums representing the loss in converting into gold that portion of the silver dollars needed to meet its gold payments, etc.

Northeastern (Georgia).—Governor Atkinson, of Georgia, announces that the state will sell this property at Atkins, Ga., to the highest bidder on April 16 next. The sale will include all the property now in the control of R. K. Reeves as agent of the state. The railroad extends from Athens to Clayton, Ga., 39¼ miles, and has been operated by the state since November 13 last, the state having taken possession on account of the continued default in interest on the bonds issued by the state in 1876 to aid in the construction of the railroad. Before November the railroad had been operated by the Richmond & Danville and as one of the Central of Georgia lines.

Northern Central.—General Manager Prevost, of the Pennsylvania Railroad, has issued his report of the operations in 1894 of the Northern Central and branches. The gross earnings were $6,031,260, being $850,545 less than those for 1893, owing to a decrease of $699,172 in freight earnings, $175,223 in passenger earnings, $2,274 in express earnings and $1,259 in miscellaneous passenger earnings, there being an increase of $6,180 in mail earnings and $21,203 in miscellaneous earnings. The total operating expenses were $4,234,116, a reduction of $529,039 as compared with 1893, accounted for by a decrease of $186,854 in conducting transportation, $172,629 in motive-power expenses, $104,645 in maintenance of cars, $64,177 in maintenance of way, and $732 in general expenses. The net earnings were $1,797,144, a decrease of $321,505, or 15.18 per cent. The passengers carried numbered 4,129,965, a decrease of 502,064, or nearly 12 per cent., and the tons of freight moved 12,008,949, a decrease of 2,287,263, or nearly 10 per cent. The total track mileage was 110.90 miles, an increase of 5.06 miles.

Oregon Short Line & Utah Northern.—The decree of Judge Gilbert in the United States Circuit Court at Portland, Or., on a petition of the American Loan & Trust Co., of New York, trustee of the junior mortgage bonds, was announced last week. The order of the court makes no change, for the present at least, in the relation of this railroad to the rest of the Union Pacific system. The Trust Company asked that the appointment of the receivers of the Union Pacific as receivers of the Oregon Short Line, which was made by the United States Court in Wyoming in an action brought under the so-called Dillon, or first mortgage, as receivers of the Oregon Short Line, be annulled. The court does not issue that order, and the authority of the Union Pacific receivers over the Oregon Short Line is not interfered with. However, the court appoints John M. Egan as separate receiver for that portion of the Oregon Short Line in the court's jurisdiction, but Mr. Egan is not to assume control of the lines until the petition of the American Loan & Trust Co. has been heard by the United States Circuit Court at Wyoming, which is the court of primary jurisdiction in which the suit of the Dillon mortgage bond holders was brought.

Philadelphia, Reading & New England.—First mortgage bondholders, at a meeting at Philadelphia last week, adopted a resolution declaring it inexpedient to push the foreclosure proceedings heretofore instituted, and that it is also inexpedient to formulate or adopt any plan of reorganization at this time. The two committees of bondholders, headed respectively by Chairman Wilson and Chairman Fletcher, still exist, and await developments. The Fletcher Committee has prepared a plan for the reorganization of the property. Mr. Wilson is the former president of the company. He considers that the route would be more successful if taken out of the control of the Philadelphia & Reading. The resolution was prefaced by a statement that the road, as now operated by the receiver, is earning considerably more than its running expenses, including rental of leased lines and the cost of many improvements and repairs to the roadway, and that foreclosure and reorganization at this time will entail heavy expenses without producing any material benefit to the bondholders.

Salt Lake & Mercur.—The railroad company has executed a trust deed to the Directors of the Mercur Mining Co., in the sum of $60,000, to secure them for funds advanced for the construction of the railroad, the Mercur Mining Co. having furnished a greater portion of the money used in building the road. The line is about 10 miles long, from near Salt Lake City to the mines of the Mercur Mining Co.

San Antonio & Gulf Shore.—The appointment of Henry E. Terrell as Receiver by the District Court was confirmed by the State Court of Civil Appeals at San Antonio last week. The case was appealed from the District Court upon the appointment of a receiver, as asked for by the plaintiffs, William Davis, formerly President of the company. The effect of the appointment of a receiver will be to suspend the work of construction out of San Antonio, and to close up the affairs of the company to the end that the property may be sold. An effort will be made to organize a new company to buy the road from the receiver and build it on through to Velasco.

South Bend & Mishawaka.—The Central Trust Company, of New York, has filed suit in the United States Court at Indianapolis against this railroad to foreclose mortgage bonds aggregating $250,000, upon which payment of principal and interest is alleged to have been defaulted. The plaintiff asks for the appointment of a receiver.

Texas, Louisiana & Eastern.—The United States Circuit Court at Galveston, Tex., has entered a decree providing for the foreclosure sale of this road by Samuel Lazarus, the present receiver, as Commissioner at Conroe, Tex., on May 2. The outstanding indebtedness of the road consists of first mortgage bonds amounting to $155,000; second mortgage bonds, $143,000; receivers' certificates, $20,000, and various other local claims. The Northern Trust Co., of Chicago, is trustee of both classes of bonds. The road to be sold includes 31 miles east of Conroe, Tex., and was built in 1892 and 1893.

Washington & Columbia River.—The Board of Directors of the company, at a meeting at Walla Walla, Wash., have decided on a plan for the reorganization of the company and taking it out of the receiver's hands. The reorganization will take effect June 1. The present receiver, W. D. Tyler, becomes President, and T. B. Wilcox, of Portland, Vice-President. The agreement is in the nature of a compromise between the parties represented by Tyler and Wilcox, who have been carrying on a litigation for many months over the bonds formerly held by G. W. Hunt, the builder of the road. Mr. Tyler represents C. B. Wright, of Philadelphia. C. B. Cox represents Ladd & Tilden, of Portland. It is stated that the company is planning some extensions which may be made on the north end of the road, in Washington.

Wisconsin Central.—The Reorganization Committee of the railroad, George Coppell, Chairman, announces that $4,937,000 out of the total issue of $12,000,000 first mortgage five per cent. bonds have been deposited with the United States Trust Co.

TRAFFIC.

Traffic Notes.

The Canadian Pacific recently took a train load of 29 cars of cotton cloth from Maine to Vancouver for Shanghai, China. It came from Biddeford.

Officers of the Northern Pacific say that considerable numbers of people are emigrating from North Dakota to the State of Washington.

The Columbian line of steamers, which is owned by the Panama Railroad, has purchased the three steamships which it has lately been running under lease. This indicates that the competition between this line and the Pacific Mail is to continue.

We learn from a St. Paul paper that low rates are promised by the Soo line (Canadian Pacific), for the fourth industrial exhibition of Japan at Kioto, April 1 to July 31. Nothing is said about engaging berths now to avoid the rush, but we advise our readers to take care not to get left.

It is announced in Philadelphia that the Reading road has opened a new freight route from the Lehigh coal region since the advance in rates over the Reading on coal coming from that region over the Lehigh Valley and the Central of New Jersey; and presumably the new source of supply is to be favored so that it can send coal to Philadelphia at the old rates. The new connection is at Treskow with the Beaver Meadow, Treskow & New Boston Railroad. This line brings coal from the mines of A. S. Van Wickle, a large operator.

The Pennsylvania Railroad reports that the quantity of coal and coke originating on and carried over its lines east of Pittsburg and Erie for the year thus far has been 4,504,890 tons, compared with 3,365,919 tons in the corresponding period of 1894, an increase of 1,138,971 tons, of which 3,270,017 tons were coal, an increase of 599,162 tons, and 1,234,073 tons coke, an increase of 1,138,971 tons.

The Interstate Commerce Commission is to make an extensive tour of the West to hear cases that have arisen in that section. At St. Louis it will hear the complaint charging that the Missouri, Kansas & Texas demands excessive rates on cotton shipped from the Indian Territory and Oklahoma. There will also be heard at St. Louis the case against the Eureka Springs Railroad on complaint of the Missouri State Board of Railroad Commissioners in regard to passenger rates. From St. Louis the commission will go to Pueblo, Denver and Omaha. The rates from Pueblo and Denver to California are to be inquired into. The Colorado people say that they cannot manufacture and ship rails, machinery and other articles successfully while Chicago, St. Louis, and other places east of the Missouri River can ship the same articles to California at very much lower rates. The people of Kearney, Neb., say the rates are too high in all directions. The Omaha Commercial Club has complained that Council Bluffs can ship to points west of Omaha at Omaha rates, while Omaha merchants cannot ship through Council Bluffs and into Iowa at Council Bluffs rates.

Chicago Traffic Matters.

CHICAGO, March 25, 1895.

The presidents and general managers of the Western lines hold a meeting here on Monday for the purpose of endeavoring, if possible, to rearrange the percentages under the Western Trunk lines agreement. The Burlington and the Missouri Pacific have been unwilling to concede the reasonableness of the percentages allotted them last October in view of the fact that the movement over their lines shows a large excess over such percentages. On the other hand, their competitors claim that the large tonnage has been forced by manipulation. At the last meeting of the committee the whole matter was referred to Chairman Bird. The report as adopted concedes something to the Burlington and Missouri Pacific, and it is understood that the new percentages are satisfactory, and that all the lines will go ahead under them with less friction than heretofore.

The Illinois Central has rearranged its suburban service, extending its express service to Blue Island, Homewood and South Chicago, and reducing the running time between Randolph street and Homewood to 57 minutes. A slight reduction is also made in the 25-mile tickets to South Chicago and Kensington.

There is little, if any, change in the eastbound situation, and it is admitted that nearly all the lines have manipulated rates, and are paying little, if any, attention to the agreement. The Chicago lines claim that it is impossible to maintain rates while the gateways between Chicago and St. Louis are uncontrolled.

Messrs. Busenbark, Hall and Chesbrough, acting as arbitrators, have awarded the Grand Trunk and the Niagara Falls Short Line the same limited differential fares on both first and second class business between Buffalo and Chicago as are now in effect over the other differential lines between those cities. The rates thus made effective are: First-class, $12; second class, $9.50.

The General Managers of the Chicago Terminal Lines have revised the agreement under which the Chicago Car Service Association is operated, and it is understood that the St. Paul and the Wisconsin Central will cancel their notices of withdrawal. The new association rules provide for transferring the supervision of the association from the General Managers to the General Superintendent's Association. The limits of the new association will include all yards within a radius of 30 miles from the Cook County Court House. Expenses will be divided upon the basis of cars reported by the various roads, the division to be made upon the total number of cars handled in the previous three months as the percentage of the current three months. The new rules provide, among other things: Ordinary free time 48 hours; 48 hours for loading cars on team tracks and 72 for loading on private tracks. Cars loaded with coal or coke may be held on the storage tracks of the roads bringing the coal or coke to Chicago, or the territory covered by the association, three days free of car service charges. After cars loaded with coal or coke are ordered from the storage tracks to the unloading tracks, or to a connecting line for unloading, the consignee will be allowed 48 hours free. On grain in bulk, car service will commence after the expiration of 48 hours from 12 m. of the day of arrival; provided that inspection of the grain is made before 10 a. m. of that day. If inspection is made after 10 a. m. car service will begin 48 hours from 12 m. of the following day. In cases where it is plain that parties in interest will not pay car-service charges under the ordinary operation of the rules, the manager, with the consent of the superintendent of the line interested, shall direct the sending of such cars to public storage houses or yards where the freight will be promptly unloaded and held subject to regular storage charges, in addition to the accrued car-service and other charges.

It is said that the Chicago and Ohio River Traffic Association is in a bad way. Rates are not maintained, and their situation is regarded as extremely critical. The Ohio River lines have probably as hard work to keep in line as those of any other association, owing to their geographical situation.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending March 23, amounted to 57,123 tons, against 64,589 tons during the preceding week, a decrease of 7,466 tons, and against 85,316 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	WEEK TO MARCH 23		WEEK TO MARCH 16.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	6,379	11.2	4.104	6.4
Wabash	9,019	15.8	7,128	11.1
Lake Shore & Mich. South.	7,031	12.3	7,151	11.1
Pitts., Ft. Wayne & Chicago	5,771	10.2	5,869	9.0
Pitts., Cin., Chi. & St. Louis.	4 597	8.0	5,676	8.8
Baltimore & Ohio	3,129	5.5	1,815	2.8
Chicago & Grand Trunk	5,019	8.7	7,677	11.8
New York, Chic. & St. Louis	4,232	7.4	11,566	18.0
Chicago & Erie	10,177	17.9	12,053	18.6
C., C., C. & St. Louis	1,769	3.0	1,550	2.4
Totals	57,123	100.0	64,589	100.0

Of the above shipments 5,183 tons were flour, 23,444 tons grain and mill stuff, 11,492 tons cured meats, 7,906 tons dressed beef, 1,276 tons butter, 1,132 tons hides and 5,254 tons lumber. The three Vanderbilt lines carried 30.9 per cent., the two Pennsylvania lines 20.2 per cent.